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TROPICAL DISEASES BULLETIN

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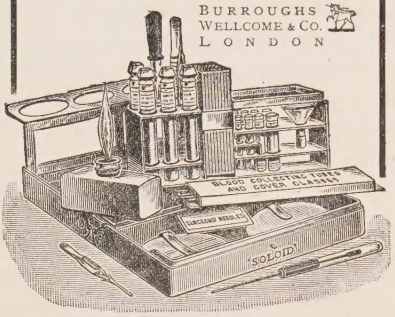

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 5.] 1915. [No. 2.

YELLOW FEVER.

YELLOW FEVER COMMISSION (WEST AFRICA).

i. **First Report.** 33 pp. 1914.

ii. **Second Report.** 147 pp. 1914. With 4 maps. Printed by Waterlow & Sons, London Wall, E.C.

i. The Yellow Fever Commission,* which was appointed by the Secretary of State for the Colonies "to study the nature and relative frequency of the fevers occurring among Europeans, natives, and others in West Africa, especially with regard to Yellow Fever and its minor manifestations," has published two Reports. In the first of these there are reviewed briefly the circumstances which led to the appointment of the Commission, and the steps which have been taken to organise the enquiry which it has been instructed to carry out. The Commission has power to appoint investigators to proceed to West Africa or elsewhere, to hold interviews with members of the West African Medical Staff and others likely to be of assistance, and to present Reports from time to time which are to be submitted to the Advisory Medical and Sanitary Committee for Tropical Africa for transmission to the Secretary of State.

The general nature and scope of the enquiry will be best illustrated by reproducing here the section headed "Problems for Investigators," to be found on page 9, Appendix I. (*a*) of the First Report:—

"*Problems for Investigators.*—In the opinion of the Sub-Committee, the following are some of the problems to which the attention of those engaged in the work of the Commission in this country and elsewhere should be specially directed:—

"1. The nature of the disease which during the years 1910–11–12 has been locally diagnosed as Yellow Fever, and which has been the cause of a heavy case mortality.

"2. Was it probably the same disease which is recorded in literature under the name of Yellow Fever as having occurred from time to time in the West African Colonies?

"3. If this disease was not Yellow Fever was it (*a*) some other recognised disease, or (*b*) a disease of unknown nature?

* The members of the Commission were Sir J. K. FOWLER (Chairman), Sir W. B. LEISHMAN, Sir R. ROSS and Professor W. J. SIMPSON.

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"4. What fevers are known to occur at the present day in epidemic form amongst (*a*) Europeans, (*b*) other non-natives, (*c*) natives in West Africa?

"5. What is the clinical course, probable pathology, and mode of infection in such fevers?

"6. What is the probable nature of the fevers which have been termed:—

(*a*) bilious remittent fever,
(*b*) malignant bilious remittent fever,
(*c*) inflammatory, endemial, or acclimatising fever,
(*d*) hyperpyrexial fever,
(*e*) three days' fever,
(*f*) seven days' fever,
(*g*) low fever,
(*h*) febricula?

"7. How can these fevers be distinguished from—

(*a*) Yellow Fever,
(*b*) Malaria,
(*c*) other known diseases?

"8. Do the following diseases occur in West Africa? If so, to what extent; and are they likely to be mistaken for other diseases of a fatal or mild character:—

(*a*) dengue fever,
(*b*) pappataci fever,
(*c*) typhus,
(*d*) Rocky Mountain fever,
(*e*) double continued fever,
(*f*) typhoid,
(*g*) paratyphoid,
(*h*) undulant fever,
(*i*) para-undulant fever and
(*j*) cerebro-spinal fever.

"9. What are the diseases to which may be attributed the large infant mortality rate amongst the natives?

"10. Is there any evidence that some or any of these diseases confer immunity to Yellow Fever, either (*a*) temporary or (*b*) lasting?

"11. Is there any evidence of—

(*a*) racial immunity,
(*b*) hereditary transmission of immunity?

"12. What is the nature of the virus of Yellow Fever?

"The Sub-Committee wish to make it plain that the foregoing is not a list of questions to which the Investigators will be expected to find answers, but merely an attempt to define and circumscribe the enquiry in detail."

ii. The Second Report opens with a short statement of the progress made by the various investigations in West Africa:—

"4. The epidemic of Yellow Fever which was in progress at Lagos at the date of their last report has not yet completely died out, and cases have also been reported from the following places:—Lagos, Ebute Metta, Warri, Forcados, Burutu, Onitsha and Calabar in Nigeria; Accra, Quittah and Saltpond in the Gold Coast; Kintampo and Ayinam (near Obuasi) in Ashanti; Bole and Tumu in the Northern Territories; Boia in Sierra Leone.

"The total number of cases to May 31st, 1914, is seventy. Of these 41 occurred in Europeans, including 4 in Syrians, and 29 in natives. Twenty-one cases amongst Europeans* and one case amongst natives proved fatal.

"5. Reports have been received from time to time from the Investigators appointed by the Commission who have been working chiefly at Freetown, Accra, Seccondee and Lagos. Special investigations have been carried out by them and also by other Members of the West African Medical Staff, into the possible mode of origin and the clinical features of the cases

* Three of these cases were Syrians.

which have occurred at a distance from those centres of work. Two officers of the West African Medical Staff in succession have suffered from Yellow Fever at Bole, in the Northern Territories of the Gold Coast, but fortunately both cases ended in recovery. A fatal case in a European Officer has occurred at Tumu, close to the northern boundary of the Northern Territories, a distance of more than 430 miles in a direct line from the coast."

The Commission then considers certain questions of a preliminary character which are closely associated with the main object of the enquiry. These are as follows :—

"(A) An Historical Retrospect of the occurrence of Yellow Fever.

(1) On the West Coast of Africa as a whole.

(2) In the ships of the British Navy on the West African Station.

(3) In each Colony, whether British or Foreign, on the West African Coast.

(4) Health conditions in the West African Colonies in 1862.

(5) An Analysis of the West African epidemics of 1910, 1911 and 1912.

"(B) A consideration of the question of Racial Immunity to Yellow Fever and of the Clinical Types of that disease, as observed in whites and in coloured people.

"(C) Yellow Fever in childhood and early life."

These form a series of most interesting and instructive articles which cannot be reviewed here in any detail. On the occurrence of yellow fever on the West Coast of Africa the opening paragraph of the article gives the general conclusion reached :—

"A knowledge of the history of the West Coast of Africa as regards Yellow Fever is almost essential to a right understanding of the epidemics of the last four years (1910–1913) and conclusively proves that the recent experience is but a repetition of that of the past which, owing to a fortunate freedom from serious outbreaks amongst Europeans for a long period, had been forgotten and had almost been replaced by a belief that Yellow Fever did not occur on the West Coast of Africa."

Under the titles of "Racial Immunity" and "Yellow Fever in Childhood," two very important statements are made. Readers are reminded that during 1905 it was shown conclusively that negroes are about as liable to contract yellow fever as the whites, and that "No one now contends that the native population of West Africa is immune to yellow fever; indeed, the evidence of their susceptibility obtained by the Commission is steadily increasing."

Accepting the statement of POTHIER that "it is remarkable how rarely children or young children die of yellow fever," the Commission remarks that if this statement is applicable to the native children of West Africa, it is not likely that it will prove an easy task to determine what proportion of such of the natives as now possess immunity to yellow fever acquired it in childhood.

With respect to the nature of the Seidelin bodies and their relation to yellow fever no definite statement is made. Decision is reserved for a future Report.

TABLE SHOWING THE INCIDENCE OF YELLOW FEVER IN THE WEST AFRICAN COLONIES AND SETTLEMENTS FROM 1900 TO FEBRUARY, 1914.

	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
Sudan		+ +	+ +					+ +	+ +						
Senegal	+ +	+		+ +	+ +	+ +	+ +				+ +	+ +	+ +		
Gambia	+ +	—	—	—	—	—	—	—	—	—	—	+ +	—	—	
Portuguese Guinea											+ +	+ +	+ +	+ +	
French Guinea		+													
Sierra Leone	—	—	—	—	—	—	—	—	—	—	+ +	—	—	—	+
Liberia															
Ivory Coast			+ +	+ +	+	+					+ +				
Gold Coast	—	⊕ ⊕	+	+	+	+	+	—	—	—	+ +	+ +	+ +	+	+
Togoland						+ +	+ +	+ +			+ +			+	
Dahomey						+ +	+ +	+						+	
Nigeria, Southern	—	—	—	—	—	—	—	—	—	—	⊕		⊕	+ +	+ +
,, Northern	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cameroons	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Epidemic of Yellow Fever = + +
Yellow Fever Reported = +
Suspicious Cases = ⊕

Reported absent or not mentioned in report = —
No Reports received Blank.

The Report ends with a list of General Conclusions at which the Commission have arrived :—

" 1. That Yellow Fever has occurred from time to time since 1778 in various parts of the British West African Colonies.

" 2. That there is no evidence to show that the infection in each outbreak has been introduced from outside Africa.

" 3. The mild nature of the attack in certain cases of Yellow Fever makes the identification of such cases a matter of great difficulty. It is therefore essential that in the future all cases of fever should be carefully observed and classified in order that, so far as possible, such mild cases of Yellow Fever may not pass unrecognised.

" 4. The attention of all workers at this subject should be specially directed to the discovery of a clinical test for Yellow Fever. The Commission do not in the least degree underestimate the importance of the researches which they are prosecuting in connection with the nature of the virus, and also of research as to the appearances by which its presence could be recognised in the body of the mosquito ; indeed, it is quite possible that by such researches the desired clinical test may be found, but the extreme practical importance of being able to determine whether a mild case of fever is or is not Yellow Fever, renders it essential that all possible methods should continue to be employed in the clinical study of the disease.

" 5. The Commission are of opinion that the day has gone by for endeavouring by the use of euphemistic terms to conceal the presence of Yellow Fever, and that the only hope of eradicating that disease lies in boldly facing the facts ; also that failure to take all possible steps to destroy a focus of Yellow Fever is an offence against the comity of nations."

C. M. Wenyon.

Couvy (L.). **Un Cas de Fièvre Jaune chez un Indigène de la Côte d'Ivoire.**—*Bull. Soc. Path. Exot.* 1914. July. Vol. 7. No. 7. pp. 552–554.

The author has recorded this case on account of the post-mortem findings, which appeared to be those of yellow fever. The patient was a native of the village Imperial, in the Ivory Coast of West Africa. He was employed as a shopman. He was first taken ill on April 13th, was worse on the following day, and suffered from fever for severa days after this. He recovered, but suffered from a severe relapse and quickly went from bad to worse. He was seen on April 19th by the author, who was informed that he had passed bloody stools, and had vomited blood, both red and black.

When first seen the patient's condition was very bad. He could hardly speak. The conjunctivae were injected and ecchymosed, but not icteric ; the tongue was white and dry ; the abdomen tender on palpation ; there had been no vomiting since the previous day, and no urine had been passed for a long time—only 5 c.c. could be drawn off by catheter, and this contained abundant albumin. The patient died six hours after this.

At the autopsy, performed fifteen hours after death, the conjunctivae were not coloured, but showed ecchymoses ; the subcutaneous connective tissue was a deep yellow colour, which was specially evident on the parietal layer of the peritoneum. The heart and lungs appeared normal. The liver was of a marked chamois colour and in a very advanced condition of fatty degeneration ; the lower surface of the liver was of a deep green lint, which contrasted with the colour of the rest of the organ. The mucous membrane of the stomach was hyperaemic and very vascular in places. The contents were a blackish liquid containing black granules. The smal

intestine was very hyperaemic and of a blackish colour, containing a dark liquid like that found in the stomach. A diagnosis of yellow fever suggested itself.

The relapse was attributed by the patient himself to a native medicament he had taken. He lived in the centre of the town in a house with his wife and son. Neither of these had been ill, nor had there been any case from which he could have been infected. He had never been sent on board a ship from the south. This case is then quite sporadic, and possibly followed on mild cases which had passed unnoticed.

The strictest measures of precaution were taken, with the result that no cases followed, so that this case remains a completely isolated instance of yellow fever if it really was of this nature.

C. M. W.

O'Brien (J. M.). **A Study of Some Cases of Yellow Fever in Guayaquil, Ecuador.**—*Ann. Trop. Med. & Parasit.* 1914. Dec. 15. Vol. 8. No. 3. pp. 369–378. With 1 plate.

The writer of the paper explains that the original purpose of his visit to Guayaquil was to gain some skill in the diagnosis of yellow fever in mild cases and in the early stages of the disease. Owing to the dryness of the season only twenty cases were seen, and of these only two could be considered as mild. Most of the cases, therefore, were severe and left no doubt as to the diagnosis.

Attention is called to one or two points. Abnormalities in the heart sounds are common ; these may be mere alterations of sound or amount to actual bruits. They frequently disappear suddenly without any reference to the condition of the patient. Two post-mortems were performed. In one an aortic valve showed a penetrating ulcer of one cusp, and in the other there was a subendocardial haemorrhage on the ventricular surface of one flap. Icterus may be very slightly marked or only transient in well-marked cases of the disease. The liver is generally painful and the spleen too at times. Increase in the quantity of albumin in the urine as the temperature drops—a classical feature of the disease—is not of constant occurrence.

Blood examination.—The percentage of polynuclears is high, while the mononuclears are generally normal. Sometimes the lymphocytes almost disappear completely. Eosinophiles are frequently absent.

As regards the appearance of the polynuclears in stained films, the author writes :—" I am inclined to think that in a very large proportion of yellow fever cases these cells are actually degenerated." This is so marked on the fourth day of the illness as to be of diagnostic value. Similar degenerate polynuclears occur in other conditions, such as plague, dysentery, typhoid, malaria, pregnancy, but these cells are not affected in a wholesale manner as is the case in yellow fever.

The author then describes the change undergone by the polynuclears. About the third day some half of the cells lose the brown stippled staining reaction which their cytoplasm has towards Giemsa ; by the fourth day almost all have lost it, and some have a cytoplasm which is hardly discernible. The nucleus during this stage remains normal. In the next stage the edges of the cell become torn and ragged, the nuclei splayed out and lightly staining, so that it may be difficult to recognise the nature of the cell. Later the cytoplasm contracts,

becomes rounded and takes on a pink colour, while the nucleus is rounded, small and intensely stained. In the most advanced stage observed the nucleus is round, with perhaps one or two drop-shaped fragments of nuclear matter near it. The cytoplasm is circular and about twice the size of a red blood corpuscle. It has a pinkish stain. This form is sparsely scattered in the slides. In yellow fever the degeneration does not always advance to the second stage—vacuolation of the polynuclears is common, but not constant. A coloured plate illustrates these changes in the character of the polynuclears.

It is stated that a patient search was made for *Paraplasma flavigenum* but without success, but that its very minute size may have caused it to escape detection.

Attention is called to the natural immunity of very young children, a fact which is recognised by all the medical men in Guayaquil. With age the infancy immunity passes off and infection may occur. This may be an exceedingly mild attack, owing to a slight persistence of the infancy immunity, and thus individuals become immunised by infection with a dose of virus which would have produced severe attacks in the completely non-immune. Mention is made of two German girls who had lived in Guayaquil till four and five years of age, when they went to Germany. They returned to Guayaquil after six years' absence when, after a few months, both suffered from yellow fever. It is suggested that in young children the liver may play a part which it does not play in the adult, and that in this way the infancy immunity may be explained.

C. M. W.

Liceaga (Eduardo). **Yellow Fever in Mexico.**—*Amer. Jl. Public Health.* 1914. Sept. Vol. 4. No. 9. pp. 786–787.

The author gives an account of yellow fever occurring in Mexico since his last report in August, 1912. During September, October and November six further cases (with two deaths) occurred in San Juan Bautista, after which the epidemic disappeared. During September and October some seven further cases (with two deaths) occurred in Frontera, presumably amongst the crew of the steamship "Walkyrian." During September two cases were found in Laguna del Carmen, one on board the steamship "Puebla," the other in the town. Since that time nine have occurred.

Five cases occurred in Merida in September and November, and another on April 8, 1913. Apparently the latter case was due to association with soldiers from Campeche. Accordingly an investigation was instituted at Campeche, with the result that new cases since May 29th numbered thirteen with seven deaths.

The total number of cases in the Mexican Republic from September 1st, 1912, up to date (September, 1913) has been forty-three, with twenty-six deaths.

In Vera Cruz no cases have occurred since February 11th, 1909, though this place was the seat of yellow fever for centuries. In Tampico the last case occurred on November 3rd, 1903. Therefore the only small focus of this epidemic disease is found in the port of Campeche.

All the measures against the disease which have been in practice since 1904 are in as full observance to-day as if yellow fever still existed on the Mexican coasts.

C. M. W.

SEIDELIN (Harald). **Transmission of *P. flavigenum* from Man to Guinea-Pig and from Guinea-Pig to Man.**—*Yellow Fever Bureau Bull.* 1914. Sept. 30. Vol. 3. No. 3. pp. 203–208. With 1 plate.

The author has inoculated himself with blood from a guinea-pig which was harbouring *Paraplasma flavigenum*, the guinea-pig in question representing the nineteenth passage of the infection since the animal was inoculated from the patient I.S. (Lagos Hospital) on the third day of his illness. The author reminds his readers that he had twice before, 1906 and 1912, suffered from attacks of fever which have, by others as well as by himself, been diagnosed as yellow fever.

The inoculation was performed on January 16th, 1914, by injection of ·5 c.c. of the heart blood of the guinea-pig under the skin of the left side of the thorax. The author's temperature before the inoculation varied from 97·2 to 98·2° F., while after it appeared slightly higher, varying from 97·4 to 98·8°. There was a certain degree of bradycardia, and albumin was present in the urine on the morning and afternoon of the 19th and the morning of the 28th of January (Tanret's and Spiegler's mercury bichloride reaction). The author remarks that all the phenomena observed may possibly fall within the limits of physiological variations, but their coincidence is remarkable, and it is quite possible that they constitute the mildest possible reaction to a yellow fever infection.

The blood was examined daily and *Paraplasma flavigenum* was found in specimens 48, 72, and 96 hours after inoculation, whilst all others were negative.

As a result of his experiment the author is led to make the following announcement, which is best produced in his own words :—

"The mild reaction in this experiment on an immune individual does not guarantee that the result would be similar if non-immune individuals were experimented upon. It appears, however, probable that a germ which had been passed successively through a large number of guinea-pigs might have become less virulent to man, and the idea suggests itself that this might be the way of developing a 'vaccine' prophylaxis against yellow fever. For this reason I believe that experiments of this nature ought to be undertaken, and knowing that an opportunity for performing such experiments is not easily obtained, I consider myself justified in publishing this suggestion, in the hope that other workers may take it up. The practical utility of a personal prophylaxis need not be emphasized."

[The subject of this paper is discussed on page 79.]

C. M. W.

SEIDELIN (Harald). **On the Existence of "Pseudo-Carriers" of the Infection in Yellow Fever.** *Yellow Fever Bureau Bull.* 1914. Sept. 30. Vol. 3. No. 3. pp. 198–202.

The author first mentioned the existence of carriers in yellow fever (1911) because he had found *P. flavigenum* in two individuals who

presented no symptoms of yellow fever. In 1912 a few more cases of apparently the same nature were mentioned. Later, in conjunction with HUTTON, the author examined the blood of fourteen of the youngest children in the girls' school at Accra, with negative results. At the dispensaries at Christiansborg and Labadie blood smears from nineteen cases of fever in children were collected, but no Paraplasma infection was found. After the author's departure the investigations were continued by HUTTON, whose results were also negative.

Some results were, however, obtained by examination of individuals under observation as "suspected cases."

"Some of these individuals were sent to hospital suffering from fever without any definite cause, others were isolated at the inspection of railway passengers leaving Lagos during the quarantine period, others again were found to have rise of temperature, and sometimes albuminuria, when examined as 'contacts' from the areas in which yellow fever had occurred. Only the individuals belonging to the first group were slightly ill, those of the latter two groups were apparently quite healthy and had, as far as it could be ascertained, no idea whatever of their febrile condition."

In the first group *Paraplasma flavigenum* was found in four out of thirty-two cases which were regarded as slightly suspicious. In the second group, mostly children, *Paraplasma flavigenum* was found in one out of six cases, while in the third group, which consisted of twenty-four children with temperatures of 99°–100°, *Paraplasma flavigenum* was found in three. These children did not appear to be ill in any way, their temperatures having been taken at an inspection of "contacts" with yellow fever patients.

It is pointed out that parasite carriers in the strictest sense should be applied to those who carry parasites while presenting no symptoms. In the second and third groups above the symptoms were so mild that unless systematically looked for they would not have been noted, so that for all practical purposes they have the same epidemiological significance as real carriers. It is suggested that they be called pseudo-carriers.

C. M. W.

WENYON (C. M.) & LOW (G. C.). **The Occurrence of Certain Structures in the Erythrocytes of Guinea-Pigs and their Relationship to the So-Called Parasite of Yellow Fever.**—*Jl. Trop. Med. & Hyg.* 1914. Dec. 15. Vol. 17. No. 24. pp. 369–372. With 1 coloured plate.

As a result of the work of SEIDELIN, and at a later date that of MACFIE and JOHNSTON on the so-called *Paraplasma flavigenum*, the authors considered it advisable to examine the blood of healthy guinea-pigs of all ages born and bred in London.

As a result they found that the red cells of such guinea-pigs harbour a small number of minute bodies quite indistinguishable from the supposed parasites of yellow fever first described by SEIDELIN. This is well brought out in an excellent coloured plate, the work of the same artist who drew the figures illustrating MACFIE and JOHNSTON's paper.

The authors deal with the difficulties inseparable from the observation of such tiny structures in red cells, and lay stress on the fact that the bodies occur most commonly in very young guinea-pigs. Indeed, the largest number is found in newly-born animals—a point against

their being of a parasitic nature, for placental transmission is exceedingly rare in the whole realm of parasitology, and is unknown in piroplasmosis, trypanosomiasis and other protozoal diseases.

The bodies are carefully described, the blue-grey colour of the substance of which they are chiefly composed being duly noted, and a list of the different forms encountered being given.

The authors then discuss the supposed inoculation of guinea-pigs with the so-called parasite of yellow fever, and record their belief that SEIDELIN and his disciples have fallen into error owing to the non-recognition of these bodies in the erythrocytes of the guinea-pigs before inoculation. They then deal with *Paraplasma flavigenum*, showing SEIDELIN'S position to be untenable and his assertions to be unsupported by scientific proof. Their view as to the real nature of the bodies, and of the whole question, is best realised by a study of their conclusions, which are as follows :—

"(1) In the blood of normal guinea-pigs, born and bred in England, are to be found bodies indistinguishable from the so-called *Paraplasma flavigenum* of SEIDELIN.

"(2) In most cases these appear to be definite structures which probably have to do with the development or degeneration of the red cells.

"(3) They are not parasitic because they occur in the blood of newly-born animals, not forgetting even the possibility of a placental transmission.

"(4) The apparent success of the inoculation into guinea-pigs of such bodies from yellow fever cases is due to a failure of a sufficient examination of control animals.

"(5) The evidence in favour of the yellow fever bodies being parasites thus breaks down.

"(6) The presence of such bodies in yellow fever bears, therefore, no diagnostic significance apart from the evidence of blood alteration.

"(7) It is frequently impossible to separate real bodies from pure artefacts, a fact which renders their differentiation one of extreme difficulty."

A. Balfour.

JOHNSTON (J. E. L.). **Yellow Fever.** [Correspondence.]—*Brit. Med. Jl.* 1914. Dec. 19. p. 1089.

This letter is a reply to a review, which appeared on p. 106 of the July 18th issue of the *British Medical Journal*, of an article by Dr. J. W. Scott MACFIE and the writer of the letter on the subject of yellow fever and the inoculation of guinea-pigs and other animals. The writer does not agree with the review for the following reasons :—

1. He considers the question of the parasitic nature of the bodies described as being still *sub judice*.

2. A variation in the character of the bodies is to be expected if one considers the extensive variation in the forms of a well-known parasite like *Plasmodium vivax*. Further, when a completely new form is being described it must occasionally happen that forms are included which subsequent observations would exclude.

3. The degree of variation of the parasites in blood films of piroplasmata of oxen is not less marked than in the bodies described as yellow fever parasites from inoculated guinea-pigs and other sources.

4. The finding of similar bodies in inoculated guinea-pigs in England is not surprising, as these animals may have a similar, though distinct, piroplasma infection.

5. The reviewer does not state clearly enough that the bodies were found in guinea-pigs in West Africa only after their inoculation. The review seems to imply that the animals were naturally infected with the parasite—a complete misrepresentation of the facts.

[It is a pity the writer of the letter does not state the extent of his examination of normal guinea-pigs before inoculation. If such animals in West Africa contained the bodies, the most reasonable assumption would be that they were the same as those in guinea-pigs in England. The matter would be still further complicated by the difficulty of distinguishing the bodies inoculated from yellow fever patients from those occurring naturally in guinea-pigs.]

A reply to this letter is given by Dr. G. C. Low on p. 1120 of the *British Medical Journal* of December 26, 1914. He refers those interested in the subject to a paper in the *Journal of Tropical Medicine and Hygiene*, December 15, 1914, in which will be found answers to the various points raised in this letter (see above). C. M. W.

Torres (Theofilo). **Prophylaxie de la Fièvre Jaune à Manaos.**—*Bull. Office Intern. d'Hyg. Publique.* 1914. June. Vol. 6. No. 6. pp. 989–995.

This paper is a resumé of a communication made to the National Academy of Medicine of Brazil.* Mention is made of the great success which has attended the anti-yellow fever measures undertaken in Rio de Janeiro with its population of 800,000, at a cost of 15,700,000 francs for the period of three years which it took to eradicate the disease. In Belem, with a population of 150,000, the period was only one year, and the cost 2,826,000 francs. It was calculated that to exterminate the stegomyia and stamp out the yellow fever in Manaos, with a population of 70,000, it would require 942,000 francs, and a correspondingly shorter period of six months. In Manaos the measures were taken up with the utmost energy by Dr. Torres and his enthusiastic supporters, with the result that in the time allotted the disease could be considered as no longer existing, though for upwards of sixty years the town had never been free. Manaos was first attacked in February, 1856, when there were 850 cases with 142 deaths out of a population of 1,300.

An interesting point shown by the statistics of yellow fever in Manaos is the great disproportion between the number of individuals affected and the number of deaths. This is explained by the fact that new arrivals contributed 50 per cent. of the cases and that unless the disease was contracted within six months of arrival the individual could be considered as immune. Old inhabitants were never attacked, and the result was that the disease ran a particularly severe course in these new arrivals, giving a high percentage of deaths.

During the six months immediately before the report was issued there had been no cases of yellow fever though the figures for 1910 showed 293 cases with 206 deaths, and for 1911 540 cases with 278 deaths. The preventive measures in Manaos have thus been as completely successful as in other places where they have been efficiently carried out. C. M. W.

*A Febre Amarella em Manáos.—*Brazil Medico.* 1914. May 8. Vol. 28, pp. 174–177; May 22. No. 20, pp. 196–198, and June 1. No. 21, pp. 205–207.

Liceaga (Eduardo). **How War has been waged in Mexico against the Mosquito.**—*Amer. Jl. Trop. Dis. & Prevent. Med.* 1914. Aug. Vol. 2. No. 2. pp. 118–123.

In 1903 a campaign against the mosquitoes of Mexico was commenced, and has been continued ever since with most gratifying results on the outbreaks of yellow fever.

The author gives a short account of the organisation, which follows the three rules of isolation of yellow fever patients, extermination of mosquitoes and protection of non-immunes from mosquito bites. In addition to the usual methods of carrying out these plans, two seem worthy of mention.

It is stated that a doctor is in charge of each district into which a town is divided. A list is kept of individuals who have not had yellow fever, and are hence non-immunes. These individuals are visited daily and their temperatures recorded. Should this be above 37·5° C., the person is treated by immediate isolation. In a similar manner there is a system of passengers' agents who travel on the railways and inspect the passengers. Should any of these have temperatures of 37·5° C., they are at once protected by mosquito veil or met and taken to the nearest lazaretto for isolation.

[If such measures can be satisfactorily carried out, it is not to be wondered that the incidence of yellow fever in Mexico has shown such remarkable diminution.]

C. M. W.

SLEEPING SICKNESS.

BRUCE (David). **Classification of the African Trypanosomes Pathogenic to Man and Domestic Animals.**—*Trans. Soc. Trop. Med. & Hyg.* 1914. Nov. Vol. 8. No. 1. pp. 1–22.

Sir David Bruce writes, "It seems to me to be as dangerous to classify trypanosomes from old laboratory strains as it would be to attempt to give the natural history of the blue rock pigeon from a study of our tame varieties," and again, "Who can tell what a trypanosome is, after it has passed through the vicissitudes and accidents of ten or twenty years of laboratory life?" All the trypanosomes described in this paper he has studied humself in the field, with the exception of *T. evansi* and *T. equiperdum*. The three points he has depended on in his classification are morphology, action on animals, and mode of development in the tsetse fly. Such methods as cross inoculation experiments and serum diagnosis he does not consider as of much use in making a simple, workable, practicable classification. "If we admit them into our methods the multiplication of species will proceed to an unmanageable degree." He defies anyone to differentiate between *T. brucei* and *T. rhodesiense* or between *T. gambiense* and *T. nigeriense* by any known method. He has been in the habit of describing the trypanosomes he has encountered according to a fixed plan, which is described.

With regard to the biometric method of measurement, he writes that the hope that species of trypanosomes could be separated by curves has not been realised, but they are useful as affording a simple means of expressing graphically the length and distribution of length in a given species. He suggests "that at least 1,000 trypanosomes taken at random from various susceptible animals should be drawn and measured by the same standard method, and that when feasible a thousand trypanosomes from a single white rat taken on ten consecutive days from their first appearance in the blood should also be measured."

Under the heading "Susceptibility of Animals," he notes that *T. brucei*, after passage through white rats for many generations, may kill them in two days, whereas the wild strain kills on an average in twenty to thirty; that *T. simiae*, which in the natural state kills monkeys in ten days, after passage through a goat loses all virulence for monkeys; and that *T. caprae* appears to be incapable in nature of infecting rodents, but can be made quite virulent for rabbits. As regards inoculations, he thinks that a minimum of ten animals of each species should be aimed at.

His classification is as follows:—

A. GROUP.—*Trypanosoma brucei* Group—

1. *Trypanosoma brucei* Plimmer and Bradford.
   Synonyms: *T. rhodesiense* Stephens and Fantham; *T. ugandae* Stephens and Blacklock.
2. *Trypanosoma gambiense* Dutton.
   Synonym: *T. nigeriense* Macfie.
3. *Trypanosoma evansi* Steel.
   Synonym: *T. soudanense* Laveran.
4. *Trypanosoma equiperdum* Doflein.

NOTE.—In the absence of Professor Yorke in Sierra Leone this Section is being undertaken by the Director.

B. Group.—*Trypanosoma pecorum* Group—
1. *Trypanosoma pecorum.**
Synonyms: *T. confusum* Kinghorn and Montgomery.
T. nanum Laveran.
2. *Trypanosoma simiae.*
Synonym: *T. ignotum* Kinghorn and Yorke.

C. Group.—*Trypanosoma vivax* Group—
1. *Trypanosoma vivax* Ziemann.
Synonym: *T. cazalboui* Laveran.
2. *Trypanosoma caprae* Kleine.
3. *Trypanosoma uniforme.*

With the exception of *T. evansi* and *T. equiperdum*, all these are carried from sick to healthy by means of tsetse flies. Each group is distinguishable or separable by well-defined characters. The chief of these in Group A are the facts that the species are polymorphic and two of them complete their development in the salivary glands of the fly. In Group B the trypanosomes are small and monomorphic and develop in the intestinal tract and proboscis of the fly. In Group C the trypanosomes are monomorphic and develop only in the proboscis of the fly (labial cavity and hypopharynx). "It is fairly easy to separate these groups in the blood of the vertebrate host, or even in the invertebrate host, by microscopic examination alone." Each species is then considered in turn. Of *T. pecaudi* the author writes:

"In regard to *Trypanosoma pecaudi* there is evidently a good deal of confusion as to what is meant. It is usually described as a dimorphic species similar to *Trypanosoma brucei*. Roubaud, however, states that it develops in the intestine and proboscis, but does not reach the salivary glands. If this is so, then *Trypanosoma pecaudi* cannot belong to the *Trypanosoma brucei* group."

Of *T. gambiense* the author says that both in Uganda and Nyasaland there was found great difficulty in starting an infection in the lower animals; it often required repeated injections before a successful result could be obtained.

The following table combines two of the author's:—

	Duration of Disease in days.		No. of Animals Used.		Remarks.
	T. brucei.	*T. gambiense.*	*T. brucei.*	*T. gambiense.*	
Man ..	90 days	2 to 5 years	—	—	
Horse ..	38 ,,	—	3	—	
Ox ..	134 ,,	R.	1	—	
Goats ..	42 ,,	R.	29	18	
Antelope	—	R.	—	—	
Baboon ..	R.	—	1	—	
Monkey ..	26 ,,	200 days	20	19	8 never showed trypanosomes.
Dog ..	34 ,,	100 ,,	25	13	9 ,, ,, †
Rabbit ..	28 ,,	—	7	—	—
Guinea-pig	67	264 ,,	15	13	12 ,, ,,
Rat ..	30 ,,	135 ,,	21	25	10 ,, ,,

† *T. gambiense.*

* "It is probable that *T. dimorphon* Laveran and Mesnil, and *T. congolense* Broden are closely allied to this species; they certainly belong to this group."

Of *T. evansi* he writes :—

"In the laboratory strain described by me in 1911, there were very few short and stumpy individuals found, but there were some, and this justifies the inclusion of this species in the dimorphic group. To put *Trypanosoma evansi* in a group separate from *Trypanosoma brucei* and *Trypanosoma gambiense* would be a most unnatural grouping, as the most cursory examination of these three species discloses the close relationship which exists between them. It is probable if strains of *Trypanosoma evansi* were studied in the field the percentage of short and stumpy forms would be found increased."

In the lively discussion which followed, this classification met with criticism both in its general plan and in detail. Such matters as the meaning to be attached to the name *T. brucei*, the priority of *T. dimorphon*, *T. congolense* or *T. pecorum* came under review. The majority of speakers agreed with the grouping as based on the mode of development in the tsetse fly.

[Sir David Bruce stated in his reply that the description given by Kanthack, Durham and Blandford, into whose hands the trypanosome sent by him from Zululand first fell (1897), showed that it was at that time a dimorphic species. It may be of interest to quote that part of the description which bears on this point :— "The nagana parasites vary considerably both in size and form ; they may be long and pointed or blunt-ended and somewhat stouter ; some individuals are short and thick with a short flagellum, their protoplasm being crowded with rounded granules."

With regard to the question, "What is *T. brucei* ?" the following observations are permissible. If the real *T. brucei* is and has always been monomorphic, its study is of little practical value, for it has not been rediscovered in Africa and must be decidedly rare. If it is a dimorphic trypanosome which has become monomorphic, the monomorphic strain is an artificial product, and again attention would be more profitably paid to the strain as it exists in nature.]

A. G. B.

Stephens (J. W. W.). **Sleeping Sickness Committee. Minutes of Evidence taken by the Departmental Committee on Sleeping Sickness,** 1914. London : Printed under the Authority of H. M. Stationery Office. [Cd. 7350]. pp. 263–265.*

Broadly speaking, Stephens writes, there are two kinds of tests by which we can distinguish trypanosomes—(1) morphological, (2) biological.

Morphological.—If morphological identity is accepted as constituting specific identity then *T. pecaudi* Laveran, *T. equi* Blacklock and Yorke, *T. ugandae* Stephens and Blacklock, and *T. rhodesiense* are identical. Objections are that sleeping sickness of the *rhodesiense* type does not occur in West Africa or the French Sudan, where *T. pecaudi* is found nor, as far as is known, in Zululand ; and, obviously, *T. equi* and *T. rhodesiense* are not the same.

* It is not the custom in this *Bulletin* to notice publications which appear outside the medical and scientific press. The portion of this communication here summarised is reprinted in the discussion on Sir David Bruce's paper (*Transactions of the Society of Tropical Medicine and Hygiene*).

Biological.—The following table shows that there is a discrepancy between the morphological and the biological tests in the case of trypanosomes morphologically indistinguishable :—

	Morphologically.	Biologically.	Authority.
T. lewisi and *T. rabinowitschi*	Indistinguishable	Distinct ..	Various.
T. brucei, Zululand, and *T. evansi* (Steel)	Indistinguishable	Distinct ..	Laveran.
T. pecaudi and *T. ugandae*	Indistinguishable	Distinct ..	Mesnil and Leger.
T. rhodesiense and trypanosome of mule, Rovuma, G.E. Africa	Indistinguishable	Distinct ..	Beck.
T. rhodesiense and *T. pecaudi* ..	Indistinguishable	Development in gut and salivary *glands* of tsetse-fly. Development in gut and *proboscis*	Roubaud and Bouet.

A. G. B.

Bouilliez (M.). **Exposé des Travaux en Cours au Laboratoire de Fort-Archambault. (Trypanosomiases ; Mouches Piquantes ; Paludisme ; Bilharziose ; Goître).**—*Bull. Soc. Path. Exot.* 1914. Nov. Vol. 7. No. 8/9. pp. 685–694.

The author says that his two predecessors at Fort Archambault (on the Shari River, 9° N.) had not found any sleeping sickness in the district, and enquiries which he addressed on his arrival to administrators always brought negative results. Later, a patient was brought to him in whose gland juice he found trypanosomes—a woman born in the district, who had never left the part between Lai on the Bahr-Sara and Fort Archambault. In January he travelled along the Bahr-Sara and found cases in several villages near the confluence of that river and the Shari. One near Dai was known by a native name which means "the place where they sleep." From this the author thinks that the disease has been there for a long time. He fears the transport of the virus by boys and native employees coming from the south. He has examined all such persons and found trypanosomes in 5 per cent. of them ; he thinks that the correct figure is probably 10 per cent. To these was given an injection of atoxyl and they were allowed to go, the diagnosis being placed on the sanitary passport. He did not find any *Glossina palpalis*, but remarks that the season was unsuitable.

As regards animal trypanosomiasis at Fort Archambault, there are horses, donkeys and goats, but no cattle. *T. pecaudi* was found in numerous horses ; two cats and a goat were artificially infected. The same trypanosome was found in a large number of donkeys. In a donkey from the Hausa country a trypanosome which suggested

T. cazalboui was found. A goat was infected by him; a cat and a monkey were resistant. Only *G. morsitans* and *G. tachinoides* have been found in this district up to the present.

A few observations are made on malaria, bilharziasis and goitre. Of blood slides collected from children, 79 per cent. were found to contain malarial parasites, chiefly *P. praecox*. Both vesical and intestinal bilharziasis are found and goitre is very general.

A. G. B.

DUKE (H. Lyndhurst). **The Wild Game and Human Trypanosomiasis; with Some Remarks on the Nomenclature or Certain Pan-African Trypanosomes.**—*Jl. Trop. Med. & Hyg.* 1915. Jan. 15. Vol. 18. No. 2. pp. 13–16.

The author refers to a previous paper in which he endeavoured to substantiate his conviction that the sitatunga antelopes on the uninhabited islands of the Victoria Nyanza are acting as a reservoir of *T. gambiense* and are responsible for the continued infectivity of the lake shore *G. palpalis* (this *Bulletin*, Vol. 3, p. 245). Striking confirmation has since been obtained.

"Two of the fly-boys who have, during the last three years, worked with Dr. Carpenter on the islands have developed sleeping sickness of the Uganda type, and trypanosomes have been demonstrated in their glands. . . . These fly-boys have been constantly exposed to the bites of *G. palpalis* during their work on the islands. For eighteen months and thirty-three months respectively they have resided on the lake shore, chiefly on the islands, and have not been exposed to any other Glossinae. They constitute, therefore, what is practically the equivalent of the crucial test, human inoculation; showing conclusively that *T. gambiense* still exists in these island flies five years after the removal of the inhabitants."

It is noted that in different parts of Africa various observers have described free-flagellated polymorphic trypanosomes, showing posterior nuclear forms, in the blood of game or domestic animals. For East Africa and Uganda Duke cites the trypanosome sent to him by MONTGOMERY (see this *Bulletin*, Vol. 2, p. 242), a similar trypanosome which he recovered from wild game from the *pallidipes* district round Lakes George and Edward (this *Bulletin*, Vol. 3, p. 31), and a trypanosome isolated from the *morsitans* country in the Northern province of Uganda from the blood of a dog. This organism Duke finds to be plentiful in both fly and game. Natives are constantly being bitten; domestic animals cannot exist. A considerable number of Europeans and Indians are also exposed to the bites of these flies, as a motor road runs for some twelve miles through the fly country. "There has, however, never been any suspicion of the existence of a human trypanosome of the *rhodesiense* type originating in this fly-belt, though a considerable proportion of the natives have been recently examined by gland palpation." Organisms of this type appear to be distributed in wild game throughout the tsetse districts of Africa.

Reference is made to the three natural groups of trypanosomes—the polymorphic, the *vivax* group and the *congolense* group. In one or other of these three groups, distinguishable roughly on both morphological and developmental grounds, can be placed the great majority of mammalian trypanosomes of Africa. In an attempt to sub-divide

the groups, however, difficulties arise which, Duke considers, are due to the unnatural way in which the finer tests are applied. How is it possible, he writes, to compare the behaviour of a strain kept up by a syringe inoculation for perhaps ten years at a laboratory with one recovered, say, direct from an antelope shot in Central Africa? He continues:—

"In nature the principal food of the Glossinae consists almost certainly of wild game, domestic ungulates, man and reptiles. Animals such as dogs, and even monkeys, and the group of so-called small laboratory animals, rats, guinea-pigs, rabbits, etc., will be comparatively rarely met with; the hyena and the jackal may, however, be considered as taking the place of the dog among the game. And yet how much of the diagnosis of species done in European laboratories is based on observations of the trypanosomes in this latter group of hosts—both as regards morphological and pathological evidence? If the behaviour of trypanosomes in these 'artificial' hosts were checked by frequent passage through the natural transmitting agent, far less confusion would result and probably very different results be obtained. . . . . .

"Some of Laveran's strains have been kept up by sub-inoculation in Europe for ten years, and yet at the end of that time they are still regarded as stock types of natural species."

Next he refers to *T. nanum* and *T. congolense* (*pecorum*). When first described, that is, when they were still fresh from passage through the insect host, these two species were distinguished by their behaviour on sub-inoculation into dogs. Seeing that the dog is represented in nature by the hyena and the jackal, this may be regarded as a natural test. In addition *T. nanum* is distinguished from *T. congolense* (*pecorum*) as less pathogenic to domestic ruminants. These differences have gradually been eliminated in the course of laboratory upkeep. In Duke's opinion *T. nanum* and *T. congolense* have far more claim to be regarded as separate species than *T. ugandae*, *T. brucei*, *T. pecaudi*, etc., ever had, for in the *morsitans* area of the Northern Province of Uganda trypanosomes occur, some of which answer to the description of *T. congolense*, others to *T. nanum*.

"By feeding small batches of wild flies on clean dogs and monkeys, and dissecting every fly of each batch, I have recently shown that the greater proportion of the flies with flagellates swarming in proboscis and gut are incapable of infecting these animals—*i.e.*, are infected with *T. nanum*; while the minority infect both dogs and monkeys with *T. congolense* (*pecorum*). In all these experiments the presence of fresh dog's or monkey's blood in the fly's gut at the time of dissection was ample proof of its having fed. Similar results were obtained when the flagellates of the proboscis were injected, and also when the blood of sheep and goats infected with the *congolense-nanum* type of trypanosome was sub-inoculated into dogs or monkeys. Thus in the wild fly of this Uganda *morsitans* country there exist two trypanosomes with the specific characters of *T. nanum* and *T. congolense* (*pecorum*) respectively. The importance of this distinction is obvious when it is realized that carnivora, rodents, and the Anthropoidea are unaffected by *T. nanum* but succumb to *T. congolense*."

In this instance the tendency of laboratory results is to "eliminate a character which natural selection seems to have fixed as a specific difference." Another tendency which he deplores is that of "manufacturing specific differences between strains of trypanosomes which natural tests adjudge to be identical." He considers that had more attention been paid to the comprehensive study of *T. brucei*, *T. ugandae*, *T. pecaudi*, *T. rhodesiense*, etc., such a variety of names would never

have arisen. The *T. pecaudi* of ROUBAUD differs from the others in that it appears to have its anterior station in the proboscis of the fly. Confirmation of this work is desirable. All the others of this group which are carried by tsetse have their anterior station in the salivary glands. The diseases caused by all are closely similar, as is the morphology. Why, writes Duke, should they not all be looked upon as one species, as indeed many investigators do regard them ?

These polymorphic trypanosomes are under ordinary circumstances non-pathogenic to man, but "expose the exceptional human being to the exceptional strain and infection will result." He would like to see all these trypanosomes described as *T. brucei*, and until it has been demonstrated that the capacity for existing in man survives transmission by Glossina from man to man and not merely from game to an occasional abnormally equipped human being, he does not see that *T. rhodesiense* can claim to be regarded as a good species. *T. brucei* var. *rhodesiense* seems to express better the relationship.

A. G. B.

BOUFFARD (G.). **Note sur la Trypanose Humaine et les Trypanosomiases des Animaux Domestiques et Sauvages dans la Boucle du Niger.**—*Bull. Office Intern. d'Hyg. Publique.* 1914. Oct. Vol. 6. No. 10. pp. 1696–1722.

The Departmental Committee on Sleeping Sickness, which reported last year, submitted through the intermediation of the Foreign Office certain questions to savants of foreign governments. Dr. Bouffard contributed the paper which is reprinted in the above-cited *Bulletin*. The greater part deals with the question of a reservoir of the virus of sleeping sickness and animal trypanosomiases, on the subject of which the Committee sought information. Dr. Bouffard, whose experience is drawn from the territory in the bend of the Niger, distinguishes two kinds of haunts of tsetse, one of small extent, on rivers of moderate size, the other much larger in regions now uninhabited. In the first kind he believes that man is the only reservoir of the virus of the human disease ; in the second (the Bani and Black Volta rivers) man cannot be because he abandoned those regions some years ago. If, however, one navigates the rivers in question in the rainy season, there are eight chances in ten that one will become infected ; the reservoir must be some wild animal. The author does not, however, think it can be antelope. The rainy season begins in April, and from the end of June pools are so numerous that antelope are not under the necessity of visiting the rivers to drink ; they are often prevented from doing so by floods. But it is just at that time that tsetse are most numerous, the percentage infected is highest, and there is most chance of contracting infection. It is thought that the flies must feed chiefly on the hippopotamus and crocodile, which are very numerous, and it is suggested that these animals may harbour the virus. With regard to the small endemic areas, he points out that the cases of sleeping sickness diagnosed are only a minority of those existing, and that the rest form the reservoir and keep up infection in the tsetse. Hence the only effective measure is the destruction of the insect host, which can easily be done in these small areas by deforestation. As regards the large areas he advises investigations to discover if

the hippopotamus or crocodile form the reservoir. The hippopotami must be hunted at night and killed away from the water so that their blood can be obtained promptly and not after the usual seven or eight hours immersion. It should then be tested by animal inoculation, the animal of choice being *Cercopithecus patas*.

A. G. B.

Macfie (J. W. Scott) & Gallagher (G. H.). **Sleeping Sickness in the Eket District of Nigeria.**—*Ann. Trop. Med. & Parasit.* 1914. Dec.15. Vol. 8. No. 3. pp. 379–438. With 5 plates and a map.

A paper on this subject by Dr. Scott Macfie, published in the *Annals of Tropical Medicine and Parasitology* was summarised in this *Bulletin*, Vol. 2, p. 344. In the present account there are many points of interest. Sleeping sickness has undoubtedly existed in the Eket district for a great number of years. There are laws and customs relating to it, which, however, have been neglected. The district contains 690 square miles, and the density of the native population is 266 to the square mile. They inhabit a great number of small towns and villages. In sixteen months 222 cases were identified by the discovery of trypanosomes, and 114 others were believed to be trypanosomiasis. Only the undoubted cases are considered in what follows; 84 were studied by the authors personally. Of the 222 cases 140, or 63 per cent., were males and 82, or 37 per cent., females. The number of infected adults of each sex was approximately equal, but boys greatly outnumbered girls, 38·7 per cent. to 17·6 per cent. Over 67 per cent. of cases were in children under 15, a much larger proportion than has been noted elsewhere; 85·1 per cent. are stated to have been under 21. Children are the water carriers and fire-wood collectors, a possible explanation.

Table 2.—Analysis of the cases of trypanosomiasis seen in Eket, and a comparison with the figures for the Congo and Gambia (Todd):—

Country.	Age.			Sex.	
	Children.	Adults.	Aged.	Male.	Female.
	%	%	%	%	%
Congo, 1903–0 ..	8·7	89·95	0·35	67·95	32·05
Gambia, 1911	24·0	76·0	0·0	55·7	44·3
Eket district of Nigeria	56·3	43·3	0·4	63·0	37·0

"No case has yet been seen in which trypanosomes could be found by the examination of a drop of the peripheral blood." In practically every case auto-agglutination was observed between slide and coverslip.

All the cases were diagnosed by gland puncture; trypanosomes were always rare and it was often necessary to puncture several glands. An examination of the natives of two villages, one where the disease was prevalent, and the other where it was rare, appeared to show that here as elsewhere prevalence of sleeping sickness cases is associated with a higher proportion of natives with much enlarged glands than

elsewhere. The death rate appears to be low. If many children died there would be a scarcity of adults, which is not the case, Eket being one of the most densely populated districts of Nigeria.

The majority of cases showed very slight symptoms. "A visitor to the isolation camp at Ikotobo, seeing the troops of children at play, or dancing on moonlight nights, would be struck by nothing so much as by the apparent good health, high spirits, and happiness of the inmates." In the majority the facial expression was dull, due in part to oedema of the face and especially the eyelids. Some degree of fever was invariably present. Enlargement of the lymphatic glands was not infrequently the only sign of the disease. Skin affections, of several types, were generally present, headache and neuralgic pains commonly. Serious involvement of the nervous system was exceptional; somnolence occurred in less than 10 per cent. Fine tremor of the tongue was common, coarse tremor of limbs and tongue occurred in advanced cases. The treatment consisted of a weekly intramuscular injection of six grains of atoxyl.

Owing to the rarity of the trypanosomes in the peripheral blood and the difficulty in infecting experimental animals it is suggested it must be very exceptional for a tsetse-fly to become infected by feeding on these cases, and an unidentified animal host is postulated as reservoir. [This seems a hardly justifiable assumption, for on the one hand the centrifuge was not used, and on the other the captive antelope in Uganda constantly infected a high percentage of *G. palpalis*, though trypanosomes could not be found in the blood by direct examination.]

Tsetse flies do not occur in large numbers. A specially trained collector seldom succeeded in bringing back more than half-a-dozen as a result of a day's search. In October and December, 1913, practically all the tsetse caught were *G. tachinoides;* this is "unquestionably the most common species." It is often seen attacking pigs. A feature of the distribution of *G. tachinoides* in the Eket district is its complete absence from the numerous waterways. These with the exception of the larger rivers and creeks are almost free from tsetse. *G. tachinoides* is found everywhere in the short scrub. This species was found to transmit three species of animal trypanosomes. Game is rarely met with. Sheep, goats, dogs, and dwarf cattle are common.

[As the authors remark a feature of this epidemic is the number of young children attacked. In this connection an extract of a report by Dr. A. D. Milne on sleeping sickness in Kavirondo, British East Africa, is given as showing that the Eket conditions are not unique. "I think the most lamentable feature of the whole tour was the extraordinary number of young children, from two years old upwards, that either showed well-marked symptoms of sleeping sickness or had enlargement of the cervical glands." Here the prevailing occupation was fishing in the tsetse-infested Kuja river, in which the whole population participated, wading in the water. Unfortunately there are no figures.]

Appendix I consists of Notes and Observations on Sleeping Sickness in the Eket District, by Mr. W. C. W. Eakin, of the Qua Iboe Mission, who suspected the existence of the disease in the district as long ago as 1906. He gives the native views on the aetiology, treatment and

prophylaxis of sleeping sickness. It is a well recognised disease, is treated by magic and the excision of the glands, and a code of laws exists for its control.

Appendix II is on Trypanosomes found infecting Wild *G. tachinoides*, by Dr. Scott Macfie. Six experiments were carried out at Ikotobo in November and December, 1913, with the object of determining the species of trypanosomes transmitted in nature by *G. tachinoides*. In four cases the flies were fed on clean guinea-pigs, in one case on a clean rat, and in one on a clean goat. Unfortunately no monkeys were available. Altogether 145 flies were used. The results are shown in the table.

Table 7.—Results of feeding wild *G. tachinoides* on uninfected animals at Ikotobo :—

Experiment No.	Number of flies fed.	Animal.	Result.
1	9	Guinea-pig	Negative
2	37	„	*T. pecaudi* (*T. brucei*, Uganda)
3	25	„	*T. pecaudi* (*T. brucei*, Uganda)
4	16	„	*T. pecorum*
5	22	White Rat	*T. pecorum*
6	36	Goat	*T. vivax*

The author is not aware that *G. tachinoides* has been previously proved to transmit in nature either *T. pecaudi* (*T. ugandae*) or *T. vivax*. [Bouet and Roubaud in Dahomey transmitted *T. cazalboui* by *G. tachinoides* in nature (*Sleeping Sickness Bulletin*, Vol. 3, p. 396).]

He notes that the percentage of flies infected is high. In the case of *T. pecaudi* and *T. pecorum* at least two of the 145 flies must have been infected with each ; in the case of *T. vivax* at least one out of 36 flies must have been infected. A table is given of the animal reactions of these three trypanosomes. The trypanosomes isolated in the second and third experiments were polymorphic, and abundant posterior nuclear forms were seen in subinoculated rats.

Tables of measurements of the trypanosomes, obtained from guinea-pigs and rats, are given and tables of distribution by percentages in respect of length. Similar information is given on the trypanosomes obtained in experiments 4, 5 and 6.

"Summary.—*T. pecaudi* (*T. ugandae*), *T. pecorum* (*T. congolense*), and *T. vivax* are transmitted by *Glossina tachinoides* in the Eket district of Nigeria, and were isolated by feeding flies caught in the neighbourhood of Ikotobo on healthy animals."

Photographs show a typical village, the characteristic vegetation, native instruments used for excision of glands, and a series of patients. The trypanosomes isolated from animals fed on by wild *G. tachinoides* are shown in a coloured plate. A map of the district is supplied. The whole forms a very complete and interesting report.

A. G. B.

Gallagher (G. H.). **The Transmission of *Trypanosoma brucei* of Nigeria by *Glossina tachinoides* with Some Notes on *Trypanosoma nigeriense*.**—*Jl. Trop. Med. & Hyg.* 1914. Dec. 15. Vol. 17. No. 24. pp. 372–375.

The author describes the district of Eket, which is intersected by streams and the vegetation of which appears to consist chiefly of palm trees and short thick scrub. Tsetse flies are not very plentiful; those found are *G. tachinoides* and, less numerously, *G. palpalis* and *G. caliginea*. Here he obtained two strains of trypanosomes which he calls *T. brucei* and *T. nigeriense*. The *T. brucei* strain was obtained by feeding 128 *G. tachinoides* on a clean guinea-pig; it was transferred to another guinea-pig and has since been maintained in this country in white rats. It is of polymorphic type showing long and slender forms with free flagellum and short and stumpy forms with little or none. Some of these have posterior nuclei. The posterior nucleated forms appeared quite early or later in the infection and varied much in numbers in different animals. When 1,000 trypanosomes were counted on approximately the same day and with the same intensity of infection, one rat contained no such forms, another 36·5 per cent. The parasites varied in length from 12μ to 32μ, average 20 to 21μ. Three curves are given. The results of animal inoculations in two guinea-pigs and five rats are tabulated. The average duration of life of the rats was 35 days.

The author discusses the identity of this parasite. Owing to its similarity in morphology and animal reactions to Bruce's Zululand strain of *T. brucei*; he considers it to be the same. He compares it also with *T. pecaudi*, found by Bouet and Roubaud in the adjacent territory of Dahomey and transmitted there also by *G. tachinoides* [these authors state that *G. longipalpis* is the natural transmitter], and thinks it is likely that these are identical, and again that *T. brucei* and *T. pecaudi* are the same. [He does not note that, whereas the *T. brucei* of Bruce develops in the salivary glands of the invertebrate host, *T. pecaudi*, according to Bouet and Roubaud, develops in the intestine and proboscis.] With regard to the contested identity of *T. rhodesiense* and *T. brucei*, and the supposed absence of the former from West Africa, he suggests that a sufficient number of laboratory animals should be kept at each dispensary in West Africa to allow of an inoculation from every human case being made. It might be found that some of the more fatal cases of sleeping sickness attributed to *T. gambiense* in West Africa are really due to *T. rhodesiense*.

The second strain, *T. nigeriense* Scott Macfie, was brought home in a guinea-pig and a monkey. These animals were inoculated with cerebro-spinal fluid obtained from a sleeping sickness patient just before death. Trypanosomes have never been numerous in the animals. An attempt was made to subinoculate three guinea-pigs, a rat and a mouse; all appear to have failed. Examination of the infected animals has revealed the remarkable short stumpy forms described by Macfie. Competent observers to whom the author has shown them "agree that they are relatively more abundant than in any strain of *T. gambiense* they have worked with."

A. G. B.

MARTIN (Louis) & DARRÉ (Henri). **Documents sur la Trypanosomiase Humaine.**—*Bull. Soc. Path. Exot.* 1914. Dec. Vol. 7. No. 10. pp. 711–716.

In this paper the following subjects are considered :—Intermittent trypanosome fever ; the duration of the latent period in the course of certain trypanosome infections ; the long duration of the period of nervous symptoms in certain patients ; and accidents in atoxyl treatment.

Intermittent trypanosome fever.—The authors have had a case in which intermittent fever, with enlarged spleen, was the only manifestation of the infection (see this *Bulletin*, Vol. 4, p. 255). Trypanosomes were found in the blood and malarial parasites were absent. The patient became infected in French Congo in March, 1913, and was treated in Paris with atoxyl at the end of May. From June to November he had every eight or ten days a violent attack of fever lasting from 12 to 24 hours. Half a gramme of atoxyl every five days had no effect, and an increase of the dosage produced only temporary improvement. In the course of March, April and May he received two series of intravenous injections of tartar emetic ; since then there has been no fever and the patient took part in the Lorraine campaign in August. The authors express reserve about the prognosis. Repeated examinations of the blood showed that the febrile attacks corresponded to the appearance in the peripheral circulation of very numerous trypanosomes which were always absent during the apyretic periods. The parasites could be discovered in the blood only at the very beginning of the fever when the temperature was still comparatively low ; when it reached its maximum none were to be found. The authors attribute the fever to the massive destruction of parasites under the influence of antibodies in the blood, in fact, to trypanolysis. They found that the blood of the patient obtained at the onset of the fever had a very marked trypanolytic power both *in vitro* and *in vivo* (inoculation into the peritoneum of a guinea-pig, which could never be infected, however rich the blood in trypanosomes). They cite another case in which the fever could be explained similarly.

Duration of the latent phase in certain patients.—As a rule, the authors say, the latent phase, when it occurs, lasts six or eight months. In a case they have recently observed the period was four years. This patient's infection was recognised, by the finding of trypanosomes, in January, 1910. When the patient was examined a few months later there was no sign of the disease, no parasites nor auto-agglutination. For four years his health remained perfect. In April, 1914, he was seized with grave nervous symptoms, trypanosomes were found in the cerebro-spinal fluid and he died in November. It is noted that GUERIN (1869) observed similar cases.

Maximum duration of the period of grave nervous symptoms.—This period, when the case is untreated, lasts six to eight months, and exceptionally a year ; even with treatment it is seldom more than a year and a half to two years. The authors had one patient in whom this period was abnormally long. When seen for the first time, in September, 1910, he had had an apoplectic attack and was hypochondriac. The cerebro-spinal fluid contained many lymphocytes and large mononuclears as well as trypanosomes. This patient is still alive, having

had in the interval periods of improvement and relapse ; the duration of the nervous period has therefore exceeded four years. They are unable to obtain another lumbar puncture.

Ocular symptoms due to atoxyl.—A case is cited in which optic neuritis occurred after the patient had received 3 gm. atoxyl in one month, a dose which is as a rule perfectly well tolerated. A. G. B.

KOPKE (Ayres). **Notes sur la Maladie du Sommeil et sa Médication***— *Bull. Office Intern. d'Hyg. Publique.* 1914. Oct. Vol. 6. No. 10. pp. 1722–1729.

Professor Kopke has treated sleeping sickness patients for the last 13 years. They have come for the most part from Principe, also from Angola and Portuguese Congo. The trypanosome in every case was believed to be *T. gambiense*. The first case mentioned is that of a negro who had trypanosomes in the gland juice. He was treated by atoxyl up to December, 1906. He then remained under observation at Lisbon till November, 1909, when he left for St. Paul de Loanda, where he is employed at the bacteriological laboratory under CORREIA MENDES. He has had no suspicious sign since the cessation of treatment, that is to say for more than seven years. Seven negro patients, all but one infected in Principe, have been under Kopke's care at Lisbon ; these have afterwards been sent to S. Thomé, an island free from tsetse flies, where they are under medical observation. He hopes to report later on their fate. A white patient who was infected in November, 1908, in Angola, reached Lisbon in October, 1909, when trypanosomes were found in the blood and gland juice. Atoxyl treatment was begun in November, 1909, and terminated in November, 1910. Seven inoculations of blood into rats made at intervals during 1910 and 1911 were negative. In May, 1911, lumbar punctures showed neither trypanosomes nor change in the leucocyte formula. The patient was seen again in January, 1914, when he was quite well. This patient therefore had remained well for over three years after the termination of treatment and six years after the probable date of infection. Another white patient, who acquired the disease in Portuguese Congo, was treated with atoxyl, and has remained well for two years at the time of writing, Kopke points out that almost all his cases reach him with trypanosomes in the cerebro-spinal fluid, and in these he has not obtained any favourable result.

Later, he used neosalvarsan injected under the arachnoid, and more recently still similar injections of galyl. The results of the former have been published (see this *Bulletin*, Vol. 2, p. 586).

With regard to transmission by other blood-sucking insects and by sexual intercourse, he thinks the part these play is very slight. In the islands of S. Thomé and Principe there are the same climatic conditions and the same insect fauna with the exception that tsetse flies are absent from S. Thomé. In S. Thomé, however, the disease has not established itself, notwithstanding the fact that cases have been imported from Angola, and he himself in 1904 found trypanosomes in the blood of several of the serviçaes in S. Thomé. A. G. B.

*Reprinted from the Minutes of Evidence taken by the Departmental Committee on Sleeping Sickness. 1914. London.

LEVADITI (C.) & MUTERMILCH (St.). **Amboceptеurs et Arsénobenzol.** —*Bull. Soc. Path. Exot.* 1914. July. Vol. 7. No. 7. pp. 633–640.

Rabbits were infected intravenously with nagana trypanosomes and were examined daily till the appearance of the crisis. The day after the crisis the animals were divided into two lots. One lot, as well as a series of fresh rabbits, received an injection of salvarsan. One-and-a-half to two hours afterwards all the rabbits were bled to death. Three kinds of serum were thus obtained: (1) Serum simply salvarsanised, (2) Serum containing trypanolytic amboceptor, (3) Serum both salvarsanised and containing trypanolytic amboceptor. These three serums were used for the injection of infected mice.

The preventive properties of the serums were estimated by the manner of development of the infection in the animals treated. Of eight experiments five gave constant results, which are shown in tables. It is seen that when the serums containing amboceptor alone, '606' alone, or '606' plus amboceptor are compared, manifest differences are seen in their action on the infection in the mice. As a rule the salvarsanised serum does not influence the multiplication of the parasites and does not much retard the death of the animal. The preventive action of the trypanocidal serum containing only amboceptor is slight; all the mice died with trypanosomes in the blood. On the other hand, the serum, both salvarsanised and trypanocidal, stopped the multiplication of the parasites and mice which received large doses of this serum did not show trypanosomes as long as the experiment lasted (up to 37 days). It follows that the association of salvarsan and trypanolytic amboceptor confers on the serum *in vivo* trypanocidal properties which considerably surpass those of serums merely trypanocidal or merely salvarsanised.

The trypanocidal activity of the three serums was then tested *in vitro*. The results showed that the trypanocidal function of the amboceptor, on the one hand, and of the arsenical derivative on the other, are not added together. Thus:

Trypanolysis by amboceptor + 606 = 1 : 500 serum dilution.
,, ,, ,, alone = 1 : 500 ,, ,,
,, ,, 606 ,, = 1 : 100 ,, ,,

It follows that the amboceptor and '606' do not act in the same manner on the trypanosomes; that they do not attack them in the same way, nor at the same place. To employ EHRLICH's terminology, the arsenic-receptor is different from that on which the trypanolytic body acts. The experiments showed also that between the salvarsanised serum *in vivo* and *in vitro* there is a striking difference. Whilst *in vivo* the action was small, *in vitro* all the trypanosomes were destroyed. The authors explain this by saying that '606' in the salvarsanised serum has no longer the same physico-chemical properties as the initial salvarsan. In the animal body it comes in contact with the parasites only with difficulty. They conclude that in the living organism one of the components of the '606' plus amboceptor complex facilitates the action of the other. The parasites attacked from two sides succumb more easily. They think that the employment of serums at once salvarsanised and trypanolytic is practicable, and they suggest that sleeping sickness patients should be treated by intra-spinal injections of serum containing salvarsan and specific amboceptor. A. G. B.

Ciuca (M.). **Sur l'Action Protectrice et Immunisante du Sérum des Animaux Trypanosomés traités à l'Émétique de Potassium.**—*Bull. Soc. Path. Exot.* 1914. Nov. Vol. 7. No. 8/9. pp. 670–677.

The author's experiments were done with rabbits, guinea-pigs and rats inoculated with the trypanosome of nagana (Uganda). The tartar emetic was dissolved in distilled water or physiological water. The trypanocidal properties of the serum of the infected animals were tested *in vitro* by mixing it in varied proportions with the blood of infected mice diluted with citrated water (2 per cent.). The protective action of the same serum was judged according to the result of the injection of the mixture under the skin of clean mice. The mixture of serum and infected blood was made before the injection. Similar experiments were done in which salvarsan or atoxyl was used. The results are shown in tables. The following conclusions were reached :—

1. The serum of an animal infected with trypanosomes and treated with emetic has protective action only when the infection was a heavy one.

2. The mixture of serum of treated animal and blood of infected mouse has no protective action.

3. The protective action of the emetised serum cannot be attributed to the direct action of the emetic (as in the case of salvarsan). An indispensable condition is that the animal into which the substance is injected should be strongly infected. The serum of a guinea-pig which, under these conditions of infection, has no protective action becomes very active 30 minutes after an intravenous injection of emetic.

A. G. B.

Mesnil (Félix). **Variations Spontanées de la Sensibilité au Sérum Humain Normal d'un *Trypanosoma gambiense*.**—*C. R. Soc. Biol.* 1915. Jan. 8. Vol. 77. No. 33. pp. 564–567.

The author and Ringenbach found in 1912 not only that *T. rhodesiense* was susceptible to normal human serum, but also that a strain of *T. gambiense* kept since 1905 in the laboratory showed a certain degree of susceptibility. This trypanosome had been maintained since the end of 1911 in mice, and at the time of the experiments its virulence for the mouse had become fixed. The age of the serum was important. With serums not more than two days old there were delays of eight days and more in the incubation of the infection, or even complete protection of the mice ; with serums kept three days and more the delay was not more than two to four days and sometimes nothing. Since 1912 the trypanosome has continued to be kept in mice. In May and June, 1914, the author reinvestigated the susceptibility of the trypanosome to normal human serum, and found that it had become augmented. Whereas in 1912 1cc. of serum given mixed with the trypanosomes completely protected the mice only when the serum was fresh, and in a proportion of about one-third, in 1914 none of the mice which received serum from 28 to 48 hours old became infected. The susceptibility, though raised, was still less than that of *T. rhodesiense*, as is shown in a table.

It is noted that there is a marked difference in the serums of infected persons. When these serums possess a specific protective power they

completely protect mice, even after two or three weeks on ice. Inversely, given a serum which after six days completely protects a mouse from *gambiense*, one can say that the person who supplied the serum is infected with trypanosomiasis. It might be supposed that the sensitiveness of this *T. gambiense* strain to human serum had steadily increased from 1912 to 1914; a table shows that this is not the case, it having been tested at intervals during that period. All the experiments were made under conditions as similar as possible. It is seen that there was a decrease of sensitiveness of the trypanosomes to the serum between May, 1913, and April, 1914.

Another point came out in the latter experiments. Whilst the action of the human serum showed itself very clearly preventively, it was very feeble when employed curatively, more so even than in 1912. It is suggested that the faculty of multiplication rather than the life of the parasites was affected by the serum. The author submits that sensitiveness to human serum is a general character of pathogenic mammalian trypanosomes, and the fact that human trypanosomes may show themselves thus susceptible indicates probably a return to an ancestral condition when these trypanosomes were not infective for man. Finally, it is noted that the Lanfranchi virus (from a case of laboratory infection) has always shown itself insusceptible to human serum.

A. G. B.

Mesnil (F.) & Bourret (G.). **Sur un Trypanosome Humain du Sénégal.**—*Bull. Soc. Path. Exot.* 1914. Dec. Vol. 7. No. 10. pp. 716–722.

One of the authors (Bourret) has tested the pathogenicity of the human trypanosome of Senegal on a certain number of animals and, like Thiroux and d'Anfreville, has shown that the virulence is low (see this *Bulletin*, Vol. 2, p. 454). He found that the patas monkey was always susceptible. The virus was brought to France in rats in May, 1912. In order to make cross immunity experiments the authors inoculated a sheep. The inoculation was made in June, 1912. The temperature rose on a few occasions, but examination of the blood was negative. Rats inoculated in July and September did not become infected. The animal was therefore reinoculated in December, 1912. A rat subinoculated in January became infected. Patas monkeys were inoculated in April, June, September and December, 1913. All became infected and showed trypanosomes in from 10 to 15 days. Two rats were subinoculated from patas 1 and two from patas 2; they did not become infected. Patas 1 and 2 died in 20 and 29 days; patas 3 and 4, on the other hand, survived five and seven months, and it is doubtful whether they died of trypanosomiasis. During 1913 and the first half of 1914 the state of the sheep continued to be good. In July it appeared ill and had various symptoms. On the 26th of this month cerebral symptoms were noted. The animal went round in a wide circle, and seemed to have lost consciousness. On the 29th it died. Sections of the brain showed inflammation of the pia mater and perivascular infiltration of the small cerebral vessels, characteristic of sleeping sickness. There were also small haemorrhagic foci in the pia mater and the brain. The authors conclude that the sheep succumbed to a

cerebral form of trypanosomiasis. They recall the case of the goat inoculated with *T. gambiense* (Uganda) which Laveran has reported (see *Sleeping Sickness Bulletin*, Vol. 4, p. 1). This goat died in 25 months after having shown symptoms attributable to affection of the medulla. The authors draw attention to the different character of the infection in the four patas monkeys and suggest that the pathogenicity of the strain changed. They note the failure to infect rats from the patas, though it was in rats that the strain had been maintained.

They then recount some researches on the protective power of the serum of the sheep at different periods of its infection. The serum was found to delay the incubation of *T. gambiense* in mice and, to a less extent, that of *T. rhodesiense*. In one case there was complete protection against *gambiense*. There was no action on *T. brucei* or *T. evansi*. They conclude that the trypanosome of Senegal behaves in the same way as *T. gambiense*. The action of the serum on *T. rhodesiense* they attribute to the fact that this species is very near to *gambiense*. They think that the species *nigeriense* should be submitted to a similar control, more complete if possible. Until proof of the contrary they agree with Bruce that it is identical with *gambiense*. Like all strains of *gambiense* recently isolated from man, there were numerous stout forms without free flagellum side by side with the long narrow forms. Posterior nuclei were never seen. Mesnil added that in his various examinations of different human viruses he had never seen a single *T. gambiense* with posterior nucleus.

A. G. B.

Laveran (A.). **L'Immunité que confère souvent aux Caprins une Première Atteinte de Trypanosomiase peut-elle être transmise héréditairement?**—*Bull. Soc. Path. Exot.* 1914. Dec. Vol. 7. No. 10. pp. 724–730.

The question whether young rats born of females immune to *Trypanosoma lewisi* are themselves immune has been decided in the negative (Laveran and Mesnil; Francis). As concerns pathogenic trypanosomes, information is lacking, but it is obviously important to know whether, in a country where a given kind of trypanosomiasis is prevalent, it would be worth while to make use, for breeding purposes, of females which had acquired immunity to that trypanosome. In the last two years several goats which have been used for Laveran's experiments have given birth to young, and he has taken the opportunity of observing whether the offspring of immune females possess immunity. He details six experiments of the kind and sums up the results as follows:—

1. A goat, recovered from a severe infection of surra and possessing immunity against surra, gives birth to a kid which dies soon afterwards. The blood of the kid collected from the heart immediately after death yields a serum which has no action, in mixture, on the surra virus.

2. A goat which has acquired immunity against surra gives birth to a kid which, 26 days after its birth, is inoculated with surra. The kid becomes infected and succumbs 71 days later with suppurative arthritis which appears to be unrelated to the trypanosomiasis.

3. A goat which has acquired immunity against surra and debab gives birth to two kids. One of these is inoculated a month after its birth with the virus of debab; it becomes infected and the infection (not yet terminated) takes its normal course. The other kid, inoculated a month and a half after its birth with the virus of surra, likewise becomes infected. In it also the infection is following a normal course.

4. A goat recovered from an infection of *T. gambiense* gives birth to two kids. The serum of one obtained a month later is inactive in mixture on *T. gambiense*; inoculated with *T. gambiense*, this kid becomes infected on two occasions.

5. A goat which has acquired immunity for *T. congolense* gives birth to a kid which, inoculated with this trypanosome 16 days later, contracts an infection of long duration ended by death.

6. A goat having acquired immunity for *T. congolense* gives birth to three kids. One, inoculated 43 days later with *T. congolense*, becomes infected and the infection runs a normal course.

All these facts, the author writes, testify in the same sense. They show that kids born of goats which have acquired immunity for a given trypanosome have no immunity for that trypanosome. It must be concluded that there is no advantage in choosing, for breeding, in a country where a given trypanosomiasis is enzootic, goats which have acquired immunity for that disease—a conclusion which is probably applicable to bovines also.

A. G. B.

Brumpt (E.). **Le Xénodiagnostic. Application au Diagnostic de Quelques Infections Parasitaires et en particulier à la Trypanosomose de Chagas.**—*Bull. Soc. Path. Exot.* 1914. Dec. Vol. 7. No. 10. pp. 706–710.

The name "xenodiagnostic" is given by Brumpt to diagnosis by examination of the habitual or vicarious vector in which the culture and evolution of the parasite occurs. In short, it is a natural culture of the parasite in a suitable host.

In 1904 the author saw numerous cultures of trypanosomes of fish in the stomachs of previously clean leeches fed on fish in which trypanosomes could not be detected by direct examination. He has now applied this method of diagnosis by leeches to the study of the trypanosomes of Batrachia and serpents in Brazil. The leeches were *Placobdella brasiliensis*, transmitting *T. leptodactyli*, and *Placobdella catenigera*. Fed on frogs apparently uninfected with trypanosomes, heavy cultures were obtained in them.

Working at Butantan, Saô Paulo, Brazil, Brumpt has also shown that *Trypanosoma brazili* from an aquatic serpent, *Helicops modestus*, evolves rapidly to the metacyclic stage in *Placobdella brasiliensis*. *T. brazili* grows rapidly in the leech and in a few weeks gives numerous metacyclic (or infective) forms, but these do not enter the sheath of the proboscis even after several months. It is probable that the serpent infects itself by ingesting parasitised leeches.

When studying the development of a haemogregarine of the aquatic serpent, *Radinia merremii*, the author found flagellates and metacyclic

trypanosomes in the stomach of the leeches. Only after five examinations of fresh material was the trypanosome found in the snake.

Certain guinea-pigs infected with *Trypanosoma cruzi* showed no parasites by direct examination, but the parasites were demonstrated by feeding the third stage larvae of *Triatoma* (*Conorhinus*) *megista* upon them. Negative results were obtained by feeding the larvae on three children with an old infection of Chagas' malady, and other diagnostic methods also failed. In recent cases, Brumpt considers that it is certain that infection would be produced. The bug can ingest 10 to 500 times the quantity of blood necessary for a microscopical preparation—a distinct advantage. Also, the leucocytes of guinea-pigs can destroy the rare trypanosomes inoculated with a sample of patient's blood. He considers that the xenodiagnostic method by larvae or nymphs of *Triatoma infestans*, *T. megista*, *T. chagasi*, *T. sordida* and *Rhodnius prolixus* has always given 100 per cent. successes, therein differing from the small proportion of Glossina that become infected with sleeping sickness parasites and various animal trypanosomes.

The author relates the various difficulties of examining patients in Brazil, and so puts forward the xenodiagnostic method. He gives an interesting account of the rearing and biology of *Triatoma megista*.

In a discussion on the paper Prof. Mesnil remarked that similar methods had been employed by Bruce and colleagues in endeavouring to find natural reservoir hosts of *T. gambiense*.

H. B. F.

Brumpt (E.) & Gomes (J. F.). **Description d'une Nouvelle Espèce de Triatoma (*T. chagasi*) Hôte Primitif du *Trypanosoma cruzi* Chagas.** —*Ann. Paulistas de Med. e Cirurgia.* 1914. Oct. Vol. 3. No. 4. 5 pp. with 1 text fig. (Also in Portuguese).

In reading the monograph of the genus Triatoma by Neiva the authors were struck by the biological adaptations of certain members of this genus, which are found both wild and inhabiting the houses of man. Thus *T. geniculata* was found by Chagas in the burrows of an armadillo and sometimes in houses, and *T. brasiliensis*, whilst it is common in the straw huts of the north of Brazil, has its normal habitat in the burrow of a rodent. During their stay at Lassance they tried to obtain specimens of these two species and visited a place about 12 kilometers away. This was a rocky uninhabited spot where there were numerous deep burrows of the rodent, *Kerodon rupestris*, called the Moco. Here, after some search, they found a larva under the bark of a dead shrub, in a mass of the moko's dejecta, and a female on a big rock which overhung the entry of a burrow. It was at once seen that this was a different species. The authors give a complete description of it and a figure, and name it *Triatoma chagasi*. It is said to be near to *T. vitticeps* Stal. The bug was found to be very voracious, biting indifferently mammals and birds. In its dejecta were found in abundance metacyclical forms of *Trypanosoma cruzi*, which was determined by infecting marmosets, rats, and dogs [details not given.]

These hemiptera rarely leave their place of birth, so it is probable that the bug became infected in biting a moco. Certainly it could not have been infected from man, the nearest houses being 12 kilometers away. CHAGAS has shown that the Tatu, an armadillo, *Dasypus novemcinctus*, may be spontaneously infected with *T. cruzi*, which seems to be transmitted to it by *Triatoma geniculata*. The authors conclude that the finding in a desert region of an infected *Triatoma chagasi* shows that the virus can exist far from man and permits of the idea that CHAGAS' disease is an infection of virgin regions which man contracts and of which he then becomes the most important reservoir.

A. G. B.

BRUMPT (E.). **Importance du Cannibalisme et de la Coprophagie chez les Réduvidés Hématophages (*Rhodnius*, *Triatoma*) pour la Conservation des Trypanosomes Pathogènes en dehors de l'Hôte Vertébré.** —*Bull. Soc. Path. Exot.* 1914. Dec. Vol. 7. No. 10. pp. 702–705.

In the study of the parasitic diseases transmitted by ecto-parasites, the author writes, any observations of the biology of the latter may have considerable practical interest. Cannibalism, or the sucking of blood contained in the body of other individuals of the species, has been noted in the genus Triatoma in the case of the species *megista*, *infestans*, *Chagasi* and *sordida* and in *Rhodnius prolixus*. It is specially frequent in young larvae and the habit diminishes with age. Triatoma usually suck bugs of the same species when well gorged with blood ; the animal fed on is often not inconvenienced and Brumpt has never known one die from this cause. Coprophagy, observed by him in the genus Rhodnius, had previously not been described in blood-sucking biting insects. *R. prolixus* has a pronounced taste for its dejecta, which shows that it may become infected from the dejecta of insects containing flagellates. It is suggested that this progressive adaptation to blood in course of digestion has perhaps been the first stage of the final adaptation to the blood of vertebrates.

The war compelled him to interrupt his experiments with Rhodnius and Triatoma, but he is able to give the result of one carried out with Cimex. In December, 1912, the defibrinated blood of an ox was mixed with defecta of *T. megista*, which contained a large number of metacyclical *T. cruzi* and apparently no crithidial forms. This mixture was put into the fresh skin of a mouse and offered to a number of *Cimex lectularius*, both adults and larvae. Almost all sucked the blood. The bugs were then kept at a temperature of 25° C. and fed on pigeons, as were a large number of controls which had never shown any flagellates in the intestine. Eight days later out of four bugs dissected one showed crithidial forms in the intestine. Two months and six days later, of two examined one showed crithidia in the intestine. Two months and fourteen days later the seven remaining bugs were killed ; one showed in the stomach the usual latent forms, and in the intestine both crithidia and metacyclical trypanosomes. Thus in three bugs out of fourteen there was a development of *T. cruzi*. He thinks that crithidial forms passed unnoticed at the time of the examination of the original dejecta and that these developed into

trypanosomes. This experiment shows that by the ingestion of developmental forms of *T. cruzi* coming from an insect fresh insects can become infected.

He notes that in certain houses in the country in Brazil all the triatomes are infected with *T. cruzi*, but none of the human or animal inhabitants. Here the flagellates may be transmitted from insect to insect by cannibalism or the dejecta.

He is carrying out fresh experiments. A. G. B.

Neiva (Arthur). i. **Infecção de Cobayas pela Passagem do** *Trypanosoma equinum* **através da Conjunctiva sã. (Nota prévia).** [Infection of Guinea-Pigs with *T. equinum* through the Healthy Conjunctiva.] —*Brazil Medico*, 1913. Aug. 22. Vol. 27. No. 32. p. 333.

ii. **Penetração do** *Trypanosoma evansi* **através da Conjunctiva da Cobaya. (Nota prévia).** [Penetration of *T. evansi* through the Guinea-pig's Conjunctiva.]—*Ibid.* Sept. 8. No. 34. p. 356.

i. A short note stating that the author had succeeded in infecting guinea-pigs after an interval of 14 days with *T. equinum* by the simple instillation into the conjunctival sac of a drop of infected guinea-pig's blood.

ii. A similar note stating that the author has obtained infection in the same way with *T. evansi* at the end of six days, although 10 minutes after the drop of blood had been instilled the conjunctival cavity was freely washed out with salt solution. The author has thus had better success than Mitzmain, who endeavoured to procure transmission of the same microbe by the bites of *Stomoxys calcitrans*, and was unsuccessful except in one instance (see this *Bulletin*, Vol. 2, p. 130).

The author was successful in procuring the transmission of *T. equiperdum* from guinea-pig to guinea-pig by the same method, the latent period being six days in this case also. J. B. N.

Rondoni (Pietro) & Rietti (Fernando). **Ricerche Sperimentali sul Nagana. V Comunicazione. Le Alterazioni Istologiche della Milza e delle Ghiandole Linfatiche nella Infezione Sperimentale da** *Trypanosoma brucei*. [Experimental Researches on Nagana].—*Sperimentale*. 1914. Sept. 21. Vol. 68. No. 3/4. pp. 379–403. With 2 coloured plates.

This paper is a continuation of previous researches on the same subject by Rondoni and his co-workers (see this *Bulletin*, Vol. 2, pp. 355 and 363). The authors find that when dogs and other laboratory animals are inoculated with suspensions of *T. brucei* the path of infection is by way of the blood-stream and not by the lymphatic passages. The examination of sections of the spleen and lymphatic glands leads to this conclusion. J. B. N.

Laveran (A.) & Roudsky (D.). **De l'Inoculabilité du** *Trypanosoma lewisi* **au Loir** (*Myoxus glis*).—*Bull. Soc. Path. Exot.* 1914. Nov. Vol. 7. No. 8/9. pp. 654–657.

The dormice (*Myoxus glis*), used by the authors in Paris, came from Lugano, Italy. Eleven were available. Two were inoculated intraperitoneally with *Trypanosoma duttoni* and found to be refractory;

the remaining nine were used for experiments with *T. lewisi*. Of the latter, two were successfully inoculated from rats and seven served for passage of the trypanosome from dormouse to dormouse. Details of the experiments with the nine animals are given.

All the dormice inoculated, whether from rat or dormouse, became infected. The duration of the infection was short (4 to 5 days), but the trypanosomes were fairly numerous in the blood and multiplicative forms were seen in every case. Inoculations from dormouse to dormouse always succeeded. *Myoxus glis* recovering from infection of *T. lewisi* became immune. It approaches the jerboa as regards inoculability with this trypanosome. The nearly related *Myoxus nitela*, which is common in France, is less sensitive to *T. lewisi*. [See this *Bulletin*, Vol. I, p. 526, regarding the experiments of Biot and Richard.]

H. B. Fantham.

Todd (John L.). **The Trypanosome of Gambian Mice.**—*Ann. Trop. Med. & Parasit.* 1914. Dec. 15. Vol. 8. No. 3. pp. 469–470. With 1 text fig.

The trypanosome is characterised by "its size and the very long distance between its blepharoplast and posterior extremity." The blepharoplast is rod-shaped. The undulating membrane is "rather scanty." There is a free portion to the flagellum. By careful focussing there are appearances of myonemes. The total length is 43μ and various dimensional details are given.

"It is concluded that the haemoflagellate seen in Gambian mice in 1902 is not a herpetomonad parasite, but a trypanosome, and that this trypanosome is possibly *T. acomys*."

H. B. F.

Darling (S. T.). **The Endotrypanum of Hoffman's Sloth.**—*Jl. Med. Research.* 1914. Nov. Vol. 31. No. 2. [Whole No. 147]. pp. 195–203. With 1 plate.

The author found the little-known parasite, *Endotrypanum schaudinni* Mesnil and Brimont (see *Sleeping Sickness Bulletin*, Vol. 1, p. 387), in the two-toed sloth, *Choloepus didactylus*, in Panama. No ectoparasites were found on the sloth. Blood was obtained from the heart under anaesthesia. Fresh films showed very few motile parasites, though stained preparations showed more endo-corpuscular forms. There was no progressive movement of the erythrocyte host cell, though the latter had to conform in a general way to the shape and motion of the parasite within. The rounded posterior end of the parasite contained the nucleus, often surrounded by granules. The attenuated anterior or flagellar end "appeared to have a very definite undulating membrane." Most of the infected erythrocytes were distorted by the lashing movements of the flagellum, which forced the host substance outwards as "a glove-like covering to the flagellum." The parasites contained no pigment. Extra-cellular forms appeared in the fresh preparations later. The author found a chromatin filament in fresh and stained specimens of the parasite. "Trophonucleus and kinetonucleus were demonstrable in all specimens."

"Extra-globular forms were only encountered after several minutes' exposure in fresh cover-slip preparations or in films that had been examined first as cover-slip preparations and afterwards made into stained films after removal of the cover-slip. This interesting phenomenon undoubtedly has an important bearing on the life history of the parasite. In many films after drying immediately and staining it was seen that all the forms were endoglobular. Evidently the parasite develops motility and escapes from the erythrocyte, but not until the blood is ingested by some suctorial invertebrate, which may act as the carrier (primitive host)." The parasite is 13·5μ long and 3·5μ broad. Various morphological details are given.

Cultivation and animal inoculation experiments were negative.

Free parasites possess "a trophonucleus and a kinetonucleus, also a chromatin filament, and a short flagellum. An undulating membrane is also demonstrable. The trophonucleus is posterior, while the kinetonucleus is always placed just in front of and to one side of the trophonucleus. This corresponds with Crithidia." The endoglobular forms are considered as ripe or unripe, according to whether they possess a flagellum or not.

No free trypanosomes were found in the sloth.

The author considers that the parasite "develops its locomotive apparatus and in the intestinal tract of an invertebrate escapes from the erythrocyte."

Unfortunately the observations on the parasite were interrupted by the author's absence from Panama.

The plate contains 15 figures. H. B. F.

BERIBERI.

VEDDER (E. B.). **Some Further Remarks on Beriberi.**—*Amer. Jl. Trop. Dis. & Prevent. Med.* 1914. June. Vol. 1. No. 12. pp. 826–847.

The author in a recently published book on Beriberi* maintains that beriberi is a disease resulting in faulty metabolism, *usually* only seen in those persons who eat rice as the staple article of diet, and is directly caused by the deficiency of certain vitamines in the food. The present article is a vindication of this theory, and in it he critically reviews the various articles that have been written lately by LOVELACE, ARNOLD, FENTON, STANLEY, and SMITH and HASTINGS in which this view is discredited and the infective theory maintained, or that the beriberi symptoms found to exist in other than rice-eating people are attributable to other diseases. When the accounts of these epidemics are carefully examined it is seen that the deficiency theory has never been satisfactorily disproved, from a want either of accurate knowledge of the food consumed or of recognition that many other foods besides rice, if taken as a staple diet, are able to give rise to this same deficiency of vitamines; for preparations made from white meal, maize, etc., are virtually the same as decorticated rice, and these, with tinned provisions in which the vitamines are destroyed by heat, are definitely beriberi-producing foods. He also draws attention to the fact that on such foods the incubation period in man is about 90 days, which will account for many of the peculiarities of the outbreaks. It is not sufficient to state that the diet has been liberal and varied, but the exact and detailed description of the food *consumed* must be given before we can be certain that a deficiency has not existed†; many of these are *ex parte* statements by those most interested in proving that the dietary supplied has been sufficient. A number of epidemics in jails, etc., in America are described in detail; these were believed not to be due to deficient food, but on careful analysis are shown to have depended upon a deficiency of vitamine containing food, though containing a sufficiency of fats, proteids, carbohydrates, salts and calories up to the standard of the physiological wants previously believed to be necessary. For prevention of beriberi in jails and institutions the following suggestions are offered.

"(1) In any institution where bread is the staple article of diet, it should be made from whole wheat flour.

"(2) When rice is used in any quantity, the brown, undermilled, or so-called hygienic rice should be furnished.

"(3) Beans, peas, or other legume, known to prevent beriberi, should be served at least once a week. Canned beans or peas should not be used.

"(4) Some fresh vegetable or fruit should be issued at least once a week and preferably at least twice a week.

"(5) Barley, a known preventive of beriberi, should be used in all soups.

"(6) If corn meal is the staple of diet it should be yellow meal or water-ground meal, i.e. made from the whole grain.

"(7) White potatoes and fresh meat, known preventives of beriberi should be served at least once a week, and preferably once daily.

"(8) The too exclusive use of canned foods must be carefully avoided."

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* Reviewed in this *Bulletin*, Vol. 3, p. 332.

† This and the preceding remarks are possibly applicable to the cases described by PRIEST (see this *Bulletin*, Vol. 3, p. 321).

With regard to legislation he points out that in America the use of glucose and talc for coating the rice has no detrimental action, but that this highly milled rice is injurious because of the deficiency of certain substances removed by the milling; that any action to make the use of this rice in the United States illegal would be absurd, but that it is desirable to prevent as far as possible its exportation in quantity to countries where it is used as a staple diet. The very similar relationship of food and pellagra to that of food and beriberi is also discussed.

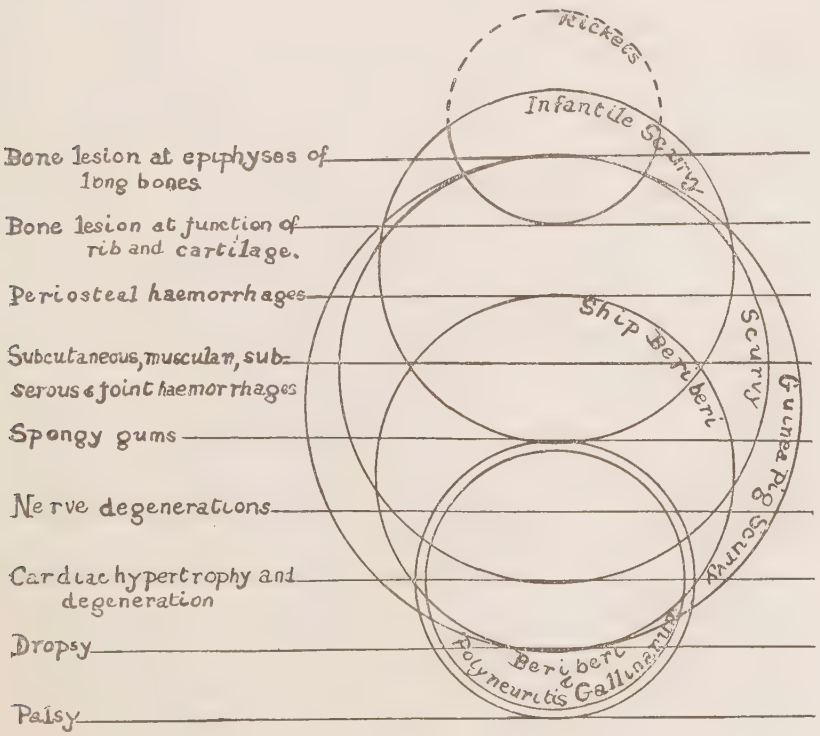
[All interested in the etiology of beriberi should read this valuable paper.]

P. W. Bassett-Smith.

Darling (S. T.). **The Pathologic Affinities of Beriberi and Scurvy.** —*Jl. Amer. Med. Assoc.* 1914. Oct. 10. Vol. 63. No. 15. pp. 1290–1294. With a chart.

This very interesting and most important paper should be carefully read by all interested in the etiology of the deficiency diseases. Funk and others have drawn attention to the close relationship of these affections; but while agreeing in the main with Funk's conclusions, the author states that at present it is not wise definitely to include pellagra. Darling gives a short summary of the group, which includes rickets, infantile scurvy, experimental scurvy of guinea-pigs, ship beriberi, beriberi, and polyneuritis gallinarum, and he shows diagrammatically how the symptoms and pathological conditions overlap.

Diagram.



In the following table he displays the chief pathological differences of these diseases so that they can be readily appreciated :—

TABLE I.—SHOWING AFFINITIES AND PATHOLOGIC FEATURES OF SCURVY, BERIBERI, ETC.

Bone lesions at epiphyses of long bones	Rickets	Infantile scurvy	*	Guinea-pig scurvy		
Bone lesion at junction of ribs and cartilage	Rickets	Infantile scurvy	Scurvy	Guinea-pig scurvy		
Subperiosteal hemorrhages		Infantile scurvy	Scurvy	Guinea-pig scurvy		
Joint, subserous, subcutaneous and muscle hemorrhages		Infantile scurvy	Scurvy	Guinea-pig scurvy	Ship beriberi	
Spongy gums		Infantile scurvy	Scurvy	Guinea-pig scurvy	Ship beriberi	
Nerve degeneration			Scurvy	Guinea-pig Scurvy	Ship beriberi	Beri-beri	Polyneuritis gallinarum
Cardiac hypertrophy and degeneration			Scurvy	Guinea-pig scurvy	Ship beriberi	Beri-beri	Polyneuritis gallinarum
Dropsy				Guinea-pig scurvy	Ship beriberi	Beri-beri	Polyneuritis gallinarum
Palsy						Beri-beri	Polyneuritis gallinarum

It should be noted that he recognises several varieties of beriberi—namely, infantile and asylum beriberi, wet and dry beriberi (these VEDDER and CLARK look upon as distinct), the Brazilian type described by LOVELACE, endemic dropsy, and endemic peripheral neuritis.

The author, with Surgeon-General GORGAS, spent much time in the study of, and obtained many specimens from, the endemic scurvy found on the Rand in South Africa. The former was struck at once by the similarity of the cardiac condition seen at post mortems with that found in true beriberi, a concentric hypertrophy and dilatation of the right heart, with degeneration of the vagus nerves. At first he was led to believe that this scurvy of South Africa was an infectious disease, but it was later found to depend on the following factors—over-milled corn as a chief article of diet, over-cooked corn, as well as over-boiled food (roasted meat never being supplied), and insufficient vegetables. Clinically, cases were seen of every degree of severity from those who had only spongy gums to those with extensive haemorrhages; in all the knee jerks were exaggerated. Some cases showed marked rickety symptoms with extreme destruction of the chondro-costal junctions, and even collapse of the sternum as in infantile scurvy; others were affiliated to beriberi with cardiac

* May occur during adolescence, but probably is not encountered in adults.

degeneration and change in the vagus nerves. Personal and racial factors have an unknown influence on the resultant symptoms, for on the same diet distinct syndromes are produced. A deficiency diet in a tropical African negro miner causes severe scurvy, and in a Cape Colony African labourer mild scurvy, and a diet that in some African negroes may cause scurvy will in others produce neuritis. It is possible that in the Rand miners there may be a latent beriberi plus scurvy. This, Darling thinks, may be definitely excluded by the facts that the knee jerks were always exaggerated and not lost as in beriberi, nor was there any anasarca, paralysis, or extreme general atrophy. Scurvy then shades off into ship beriberi in one direction and towards rickets in the other. The Rand scurvy, besides showing the cardiac changes, differs from the ordinary forms found in times of poverty and famine in that it does not so readily yield to treatment. The author sums up in the following words :—

"The striking excentric hypertrophy and dilatation of the right heart with extensive fatty degeneration of the same musculature, the left heart remaining apparently normal, and the severe degeneration of the vagus nerves described here from several cases of scurvy from the Rand, furnish new and additional facts which show the intimate relationship between scurvy and beriberi as to etiology. The affinities between these two diseases and certain other cachexias lend emphasis to the opinion that they are all the result of the continued use of one-sided and deficient diet."

P. W. B.-S.

Little (J. M.). **Beriberi.**—*Jl. Amer. Med. Assoc.* 1914. Oct. Vol. 63. No. 15. pp. 1287–1290.

It has long been known that cases of beriberi occur in Newfoundland and Labrador, and these have been attributed to the use of a diet often with a great want of variety and deficient in vitamine value, the staple article of food being wheat flour, not rice as in the Far East. The author states that the natives have for many years recognised that in the winter, when the fowls are taken into their cabins, the birds develop polyneuritis gallinarum unless some other food than white bread is given to them. Among the fishing people it is in the vessels that go to the far north, away from the base of fresh supplies, that beriberi most often occurs, and among the shore fishers, who have to depend at certain times of the year almost entirely on white flour for food. The prevalence of the disease is considerable, for out of 5,000 out-patient cases seen at St. Antony's Hospital (Newfoundland) 220 had beriberi, six deaths being recorded, all in acute cases, three of which were of the "wet" type. The general character of the symptoms, diagnostic signs, and methods of treatment are given at some length, but they do not differ from those of other endemic regions, though special stress is placed upon the evidence of involvement of the nerves in early stages of beriberi, differentiating the disease from the closely allied condition of scurvy, common in the same area. A note of warning is also sounded on the probable increase of beriberi as tinned or denaturised foods more and more take the place of fresh meat, especially when associated with a staple diet of white bread.

[Darling shows in the paper above that nerve degenerations do take place in scurvy, especially in that form found in South Africa.]

P. W. B.-S.

STRONG (W. M.). **Beriberi in Papua (British New Guinea).**—*Jl. Trop. Med. & Hyg.* 1914. Oct. 15. Vol. 17. No. 20. pp. 310–311.

After ten years' experience as Health Officer in New Guinea the author gives some interesting information about the prevalence of beriberi in this region. The disease is most commonly found in natives who are fed on European articles of food, more particularly in the jail at Port Moresby. The prison diet per week is—rice, 10½lb.; biscuits, ½lb.; sugar, ½lb.; tinned meat, 1lb. On this diet cases of scurvy occurred, associated early with "sore mouth." These generally rapidly improved when fresh vegetables or limejuice were given. From 1903 to 1905 there were a number of cases in the jail of an acute or fulminating type of beriberi; in 1906 native foods were supplied, and these cases then became very rare. Sub-acute and chronic forms were also met with, but these, too, were less common after the diet had been improved. In the Purari delta the author found many cases of atrophic nonspastic paralysis, evidently chronic beriberi. In this swampy region, where vegetables were scarce, the natives lived almost entirely on sago, which is probably a food deficient in vitamines. In 1913, when the native vegetable foods at Port Moresby were scarce and the staple article of diet was sago, again beriberi appeared. The author also notes that after bacillary dysentery beriberi is not uncommon, which he thinks is probably due to insufficient absorption of food. He also shows how important it is to note the pulse rate of native labourers who are reported as slack at work, as beriberi overlooked may lead to disastrous results. The evidence of much oedema, or the wet form of beriberi, is apparently rare in this region.

[The association of scurvy and beriberi in a tropical climate where vegetable foods are the staple articles of diet recalls the experience of GOUZIEN in Tonkin (this *Bulletin*, Vol. 1, pp. 170–171); the etiological relationship of sago to beriberi is important.]

P. W. B.-S.

MATHIS (L.). **Contribution à l'Étude du Béribéri. Considérations sur la Tuberculose parmi la Population Indigène du Tonkin.**—*Ann. d'Hyg. et Méd. Colon.* 1914. Apr.–May–June. Vol. 17. No. 2. pp. 483–500.

The author from his experience with the French troops in Tonkin states that beriberi cannot be considered as endemic at Caobang, but it undoubtedly exists and at times causes much trouble. It is said to have been introduced into the prison there in 1905 by a number of Annamites, who had been transferred from Hanoi, where the disease was prevalent. Most of these cases died, but the disease spread to the annex prison of Cau-Dong, a few cases appearing yearly. Again in 1910, after another large transfer of prisoners, there was a fresh epi-epidemic. The type seen was mostly of the wet form and the mortality was high, 34 per cent. The author is convinced that the disease is a toxic infection probably due to a protozoal organism (this opinion he founds on the absence of a polymorphonuclear leucocytosis and a diminution of the eosinophiles), but that the ingestion of rice plays an important part in the causation, for the cases are practically limited to those who are chiefly rice eaters, rarely occurring in Quang-Tcheou-Wan,

where the people are miserably poor, but eat scarcely any rice. He found that the use of decorticated stale rice was associated with recurrences of epidemics and that the people who lived in villages suffered the least, their food being less often stale and better cooked (sterilised). The author is a strong supporter of the infectious theory of beriberi, and believes that stale rice acts probably as a medium by which the infective agent is introduced into the body where it undergoes some development, frequently giving rise to intestinal symptoms. He advocates a more careful search in the rice for micro-organisms, and states that prophylactic measures are simple. (1) Remove infected persons from towns to the country villages, where the disease does not apparently spread; (2) Use recently decorticated rice, if possible prepared daily and have it thoroughly cooked to ensure complete sterilisation; (3) Prohibit all other stale or possibly infected food (such as fish) and substitute fresh beef, eggs, vegetables, and fruit. Active medical treatment he strongly condemns, such as atoxyl, salvarsan or lumbar puncture.

P. W. B.-S.

Smith (F.). **Beriberi or Polyneuritis among British Troops in India.**—*Jl. R. Army Med. Corps.* 1914. July. Vol. 23. No. 1. pp. 64–66.

In a previous paper [see this *Bulletin*, Vol. 1, p. 486], the author and Captain Hastings described the occurrence of multiple neuritis among the soldiers at Lebong, in the Darjeeling Hills; they then believed it to be a place disease and infective. Further observation has strengthened this belief, for a healthy regiment which was quartered at Lebong in place of the affected one became infected with the disease, regiments at other military health resorts near to remaining free. An account of a discussion on this subject at the All India Sanitary Conference is given in which the etiology of beriberi was considered, but no conclusion was arrived at.

P. W. B.-S.

Cardamatis (J. P.). Καρδαματη (Ιωαννου Π.). Ἡ πολλαπλῆ περιφερικὴ νευρῖτις ἢ Νόσος Beriberi ἐν Ἑλλάδι [Multiple Peripheral Neuritis or Beriberi in Greece.]—„Ἰατρικὴ Προόδος.“ 1914. Aug. 1 and 15. Vol. 10. Nos. 15 & 16. pp. 58–59.

In connection with a reported case of beriberi in Greece the author takes the opportunity of saying that a few years back, when the territory of Greece was less than it is at present, he instituted an enquiry as to the existence of the disease in the country and could find no evidence of its presence.

J. B. Nias.

Yamagiwa (K.). **Experimental Study on the Cause and Origin of the Beriberi. 3rd Report.**—*Sei-i-Kwai Med. Jl.* 1914. Sept. Vol. 33. No. 9. (Whole No. 391. pp. 55–56. [The Original in No. 10, Vol. 28 of the *Jl. Tokyo Med. Assoc.*]

A short epitome is given of a comparative study of the pathological changes found in the experimentally produced beriberi of fowls and those which occur in human beriberi. It is

stated that pericarditis, fatty changes in the cardiac muscles, a small cell perivascular infiltration of the liver, numerous eosinophilic cells in the liver and spleen, with a severe catarrh of the stomach and intestine, are more often found in fowls, while segmentation of the heart muscle fibres, and degenerative changes in the epithelium of the convoluted tubes of the kidney are most common in human beriberi. In conclusion the author considers that the disease in fowls which are fed upon decorticated rice is an intestinal auto-intoxication and not due to a condition of partial inanition. P. W. B.-S.

Ido (Y.) & Watanabe (Y.). **The Orthodiagraphic Examination of the Heart by the Beriberi**—*Sei-i-Kwai Med. Jl.* 1914. June 10. Vol. 33. No. 6. (Whole No. 388) pp. 35–36. [The Original in No. 22. Vol. 27 of the *Jl. Tokyo Med. Assoc.*].

By orthodiagraphic examination of the heart in various stages of beriberi the authors detected certain changes which seemed to be characteristic. These were a widening to the right and a bulging of the lower border, with an alteration in the position of the pulmonary artery and left auricle, which appeared to be pushed towards the left. These changes disappeared during convalescence. P. W. B.-S.

Werner (H.). **Morbus Basedowii bei Beriberi.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1914. Apr. Vol. 18. No. 8. pp. 283–284.

The author describes a case of dropsical beriberi occurring in a Chinese stoker, which was associated with symptoms of exophthalmic goitre (Graves's or Basedow's disease). A week before admission to hospital the patient had suffered from palpitation, shortness of breath, and swelling of the legs; the latter disappeared after a few days, but was followed by loss of muscular power, swelling in front of the neck and protrusion of the eyeballs. On admission to hospital there was marked atrophy of the peroneal muscles and those of the forearm, with loss of knee jerks, but no sensory changes. The right half of the thyroid was much enlarged with marked exophthalmos and there was a convergent strabismus, the two latter symptoms following the onset of the beriberi symptoms. The pulse was rapid and the heart's action irregular; there was also a slight pyrexia. On a mixed diet with rice bran he improved markedly and after six weeks was discharged to duty. The author states that "taking into consideration the frequent implication of the sympathetic system in beriberi and the important etiological rôle which this system plays in Basedow's disease, he considers that the beriberic origin of this case is not improbable, and it will be interesting to note if similar conditions are found by others." P. W. B.-S.

Handa. **Concerning the Treatment of Beriberi.** (Translated from the Japanese by Major George H. R. Gosman).—*Military Surgeon.* 1914. Sept. Vol. 35. No. 3. pp. 263–272.

After thirty years' clinical experience of beriberi in the Japanese army, including the periods of the Japanese-Chinese and Japanese-Russian wars, the author finds it best to divide the disease into two

stages, *Progressive* or oedematous, and *Retrogressive*, or what H. WRIGHT calls "beriberic residual paralysis." Handa includes the acute cardiac attacks in the progressive stage. He states that patients, particularly when on active service, should never be moved until the second stage has set in, and to hasten this he pins his faith to purgatives, chiefly sulphate of magnesia. The worse the case the larger the dose must be, up to 150 grams in twenty-four hours. When vomiting is present calomel is useful to set up the initial purging, after which the magnesium sulphate should be given.

He states that this treatment, associated with rest and proper dieting (exclusion of any kind of rice and substitution of barley foods with milk, meat, and vegetables), is most successful. Too often the dose of the sulphate is inappropriate; to a grave case, which should have in twenty-four hours 60 grams or over, 30 grams is given, suitable only for a mild one, and the result is unsatisfactory. When cardiac symptoms are present this treatment is more urgently demanded and with it the decrease in the area of heart dullness is often very marked. With these massive doses he has never seen any bad results. The rest, which is so absolutely necessary for the first type of cases, is not required in the retrogressive condition unless cardiac palpitation is marked, but rice must still be omitted, a more mixed and varied diet being given.

P. W. B.-S.

HONDA (K.). **Ueber die pathologisch-histologischen Befunde des nervous Systems bei Beriberi.** [The Pathological Histological Changes of the Nervous System in Beriberi.]—*Mitt. a. d. med. Fakultät d. Kaiserl. Univ. zu Tokio.* 1914. Apr. 25. Vol. 11. No. 3. pp. 319–416. With 2 tables and 5 plates.

The author in reviewing the literature shows how diverse are the views held not only as to the amount of implication of the cord and the peripheral nerves, but also as to the character of the changes in the nerves themselves. After an examination of numerous sections from 26 cases (3 acute, 2 infantile, and 21 chronic), he was able to classify the nerve changes in three groups:—(*a*) *Changes without interruption of continuity:* Analogous to cloudy swelling, affecting both the axis cylinder and medulla. It is present in almost all nerves and obviously is an early stage. It may terminate in complete restoration, advancing degeneration, or in course of time in atrophy. This is not peculiar to beriberi. (*b*) *Changes with interruption of continuity:* The nerve changes are not diffused, but are localised in patches; all degrees of degeneration may be seen near together. The medullary sheath is divided up into fragments, the continuity of the axis cylinder is not broken, but it may be charged with coarse and fine granules. These changes denote more or less functional loss. (*c*) *Atrophic changes:* The nerve bundles are greatly shrunken, the medullary sheath is nearly normal, but the axis cylinders are narrow and uneven; the interstitial tissue is generally increased. In these cases function will be greatly disturbed, but not quite lost.

He notes that there is no sharp line between these three stages, and that the "intensity" of the lesion in the periphical nerves is greater in chronic cases, whereas the "extension" is more marked

in acute ones. The condition (*a*) is found in almost all nerves and in all acute cases; (*b*) and (*c*) are found generally in the nerves of the extremities, never in the vagus, rarely in the phrenic, and are present after the disease has lasted some time. The author would define acute beriberi as that form of the disease in which the vital nerves (phrenic and vagus) are affected at the same time as the nerves of the extremities, chronic beriberi when the nerves of the extremities are first affected, while the vital ones show little or no change. The condition found in infantile beriberi was closely related to that found in the acute adult form.

In the cord vacuolation of the ganglionic cells was found, but no special nerve tracts were affected. Circumscribed, greatly altered foci in the spinal roots were very commonly seen; these were probably artificial. The changes in the nerves are therefore: first, cloudy swelling; second, degeneration; third, atrophy. The author is inclined to believe that these conditions are due to a beriberi poison which has a selective action. Details and summaries of special cases are given, with five very excellent coloured plates. P. W. B.-S.

McCrae (J.). **The Phosphoric Oxide Content of Maize Flour.**—*Jl. of Hygiene.* 1914. Nov. Vol. 14. No. 3. pp. 395–398.

Fraser and Stanton have shown that highly polished rice gives rise to polyneuritis, but that whole rice does not, and that the disease can be cured by adding rice polishings to the diet. Whole rice contains 0·469 per cent. of P_2O_5, polished rice only about 0·277 per cent., and the polishings 4·2 per cent; they do not claim that the P_2O_5 is curative, but that it is an indicator, the vitamine being the active principle, and it is known that the vitamines in different grains and natural products are not identical. In the case of maize flour the loss of phosphoric oxide is similar to that of rice flour, but not quite so marked, and it is probable that a diet of maize meal is not so harmful as that of rice in which the phosphoric oxide is reduced to ·27 per cent. As maize meal is the staple article of diet for the native labourers in the Transvaal it is desirable to find a method of milling which shall minimise this loss of P_2O_5 (and vitamine).

When the maize was so treated that 96 per cent. of the original grain was converted into fine meal, it was found to contain nearly as much P_2O_5 as the whole grain.

Percentage of P_2O_5.

	A	B	C	D	E
Whole Maize ..	·53	·49	·48	·57	·45
Fine Meal	·51	·46	·46	·53	·45

Experiments on 6,000 native labourers are being conducted with the old meal and the new, the men being divided into two equal groups, and so far the incidence of disease among those using the new meal is much less than those having the old. Full reports will be furnished later by Dr. Macauley, but it seems that the over-milled maize is a food defective in some properties, which induces a form of deficiency disease, and that when the whole grain is used as flour the defect is remedied. P. W. B.-S.

Braddon (W. L.) & Cooper (E. A.) **The Influence of Metabolic Factors in Beri-Beri. Part 1. The Effect of increasing the Carbohydrate Ration on the Development of Polyneuritis in Birds fed on Polished Rice.**—*Jl. of Hygiene.* 1914. Nov. Vol. 14. No. 3. pp. 331–353.

A large number of observers have shown that polyneuritis in fowls develops proportionately to the quantity of polished rice ingested; that is, that though there had been a larger total of vitamine taken it was not able to protect the birds when the food ration had a low content of anti-neuritic substance. The same has been observed with human beriberi, for in epidemics the well nourished are more liable to the disease than the under fed, and men, who take more polished rice, are more liable than women who usually eat less. In prisons and asylums every increase in the polished rice component of the diet, other food stuffs remaining the same, was attended with an increase of beriberi. From these observations Braddon concluded that in rice-eating people the severity of beriberi varies directly with the quantity, absolute or relative, of the polished rice consumed. If we admit then that beriberi is due to the deprivation of a certain essential factor, it is important to determine the precise rôle which the active substance plays in metabolism, and to fix if possible the quantitative relation it must bear to the other components of the dietary. With this object a very large number of experiments was carried out, partly by Braddon in the Malay Federated States, and partly by Cooper at the Lister Institute, London. These are described in detail in the paper. The main conclusion arrived at is that the amount of anti-neuritic substance required by the organism increases with the quantity of carbohydrate *metabolized*, and for the prevention of beriberi the proportion of the anti-neuritis food-stuff in the diet must be as high as possible, and large rations of food stuffs deficient in the active substance carefully avoided.

The summary and conclusions arrived at by the authors are of sufficient importance to be here given in extenso :—

"(1) Chickens fed on $\frac{1}{20}$ their body-weight daily of padi, cured or parboiled unpolished rice, or fresh (partly polished) rice, remain free from polyneuritis for at least 28 to 100 days.

"(2) Chickens fed on the same ration of polished Siam rice develop symptoms of polyneuritis in from 20 to 70 days.

"(3) When the polished rice is soaked in excess of water for 24 hours the birds succumb to polyneuritis in from 10 to 35 days; when the rice is soaked for 48 hours the disease appears still more readily, viz. in 15 days.

"(4) Chickens fed on $\frac{1}{20}$ their body-weight of parboiled rice which had been soaked for 24 hours also develop polyneuritis in from 13 to 39 days. This fact is of practical importance, as epidemics of beriberi have been traced to the practice of soaking unpolished rice prior to cooking and discarding the water.

"(5) Although birds fed on diets of polished rice, sago, or glucose develop polyneuritis, when fed on commercial starch they often fail to do so and merely lose considerably in weight. An explanation is offered.

"(6) While fowls fed on $\frac{1}{20}$ their body-weight of padi remain free from polyneuritis for at least 60 to 100 days, when this ration is supplemented by $\frac{1}{8}$ the body-weight of washed unpolished rice, or $\frac{1}{10}$ of polished rice, polyneuritis appears in from 20 to 30 days.

"(7) On the other hand, chickens fed on rations varying from $\frac{1}{5}$ to $\frac{1}{30}$ of their body-weight of washed unpolished rice develop polyneuritis in about the same time, 10 to 20 days.

"(8) On dietaries composed of rations of polished rice varying from $\frac{1}{20}$ to $\frac{1}{40}$ the body-weight and of yeast varying from $\frac{1}{2500}$ to $\frac{1}{3500}$ the body-weight pigeons and chickens do not develop polyneuritis until at least 32 to 100 days have elapsed, but when the carbohydrate ration is doubled by the addition of polished rice or sago the birds fall ill in from 13 to 46 days.

"(9) Even when daily rations of polished rice as large as $\frac{1}{10}$ the body-weight are fed to chickens together with varying amounts of yeast, 93 to 98 per cent. of the carbohydrate is digested and absorbed and the excreta contain no anti-neuritic substance. This shows that the rapid development of polyneuritis induced by feeding large rations of starch is not due to interference of undigested carbohydrate with the absorption of the active material.

"(10) Intestinal bacteria, unlike yeast, contain little anti-neuritic substance.

Conclusion and Practical Application of the Results.

"The amount of anti-neuritic substance required by the organism increases with the quantity of carbohydrate metabolized. For the maintenance of health the intake of active substance must therefore be adjusted, so as to stand in some quantitative relation to the ration of carbohydrate ingested, and it is when this necessary balance is not maintained in the dietary that beriberi results. Although as ordinarily induced beriberi can be described not inaccurately as a 'deficiency disease,' it may thus actually develop when a dietary containing an adequate amount of the anti-neuritic substance is regularly supplemented by a ration of a carbohydrate foodstuff deficient in this essential substance.

"This is obviously of great practical importance in the prevention of beriberi. Attention must be paid not only to the absolute amount of anti-neuritic foodstuff incorporated in the dietary, but to the proportion which this bears to the total carbohydrate ration. The precise relation which must subsist between the supply of active material and the amount of carbohydrate metabolized has not yet been ascertained, nor has it been determined for the other normal components of a dietary, *e.g.* protein and fat. It is therefore advisable to maintain the proportion of anti-neuritic foodstuff in the diet as high as possible, and large rations of foodstuffs deficient in the essential substance should be carefully avoided.

"In the preparation of a dietary to obviate beriberi, it thus becomes necessary to consider not merely its absolute content of anti-neuritic material, but also its total calorific value."

P. W. B.-S.

McGarrison (Robert). **A Contribution to the Study of Experimental Beriberi. (Preliminary Note).**—*Indian Jl. Med. Research.* 1914. July. Vol. 2. No. 1. pp. 369–374. With 4 plates.

In an experiment bearing on the etiology of beriberi 36 pigeons were used; 12 were fed on dry polished Rangoon rice, 12 on the same rice boiled, and 12 on a good mixed diet for one month. In group (1) seven birds developed polyneuritis, in group (2) nine suffered; all the controls remained healthy. It is noted that each bird used was infected with Halteridium. Cultures made from the liver, kidney, spleen and heart of five of the affected birds killed late in the disease showed a profuse growth of an organism of the *Bacillus suipestifer* group. The same organism was obtained much less abundantly from eight of the pigeons which had been fed on polished rice, but had not given any signs of polyneuritis, though they were in an early stage

of the disease as shown by the presence of degeneration of the sciatic nerves. Four of the control pigeons were also examined; in three the organs were sterile, in one the organism developed in small numbers from the spleen, liver, and kidney. Inoculations of this culture growth were made into 6 rabbits, 8 fowls, and 14 pigeons, all of which were kept on good diet. In 19 or 67 per cent. symptoms clinically like those of polyneuritis set in within nine days. The sciatic nerve in all showed degenerative changes, and the inoculated organism was recovered. In the 17 controls the tissues were sterile and the sciatics were healthy. In a foot note, it is stated that the same bacillus has been obtained from the internal organs of a second series of 25 pigeons suffering from experimental polyneuritis. There are four excellent plates showing the affected animals and birds and examples of degenerated nerve fibres.

[These interesting and highly suggestive experiments will no doubt be followed up by workers in other localities, and, as the author remarks, "they will form the subject of further enquiry" before we add this bacillus to the long list of causes of beriberi. Paresis of the limbs is a very common sign attending septicaemic conditions in animals.]

P. W. B.-S.

Gibson (R. B.) & Concepcion (Isabelo). **Nerve Degeneration in Fowls fed on Unhusked Rice (Palay).**—*Philippine Jl. of Sci.* Sect. B. Trop. Med. 1914. Feb. Vol. 9. No. 1. pp. 119–122. With 1 plate.

Many observations of different experimenters are quoted to show that beriberi symptoms will occasionally arise both in birds and man when unpolished rice has been used for food, leading to the conclusion that the rough rice does not contain in the cortex the protective substances in sufficient amount to prevent the development of beriberi in the more susceptible individuals, or in other words, "*the unpolished rice, per se, affords only partial protection against beriberi.*" To demonstrate experimentally that this is the case, they fed six fowls for periods of from two to four months in this way and then examined the sciatic nerves. These showed degenerative conditions which corresponded with those found in two weeks in fowls fed on polished rice. From this they deduce that the addition of other foodstuffs to a diet of unpolished rice is essential to meet the normal nutritive requirements of the body.

P. W. B.-S.

Stepp (Wilhelm). **Ueber Lipoidfreie Ernährung und ihre Beziehungen zu Beriberi und Skorbut.** [Lipoid-free Food and its Relation to Beriberi and Scurvy.]—*Deut. Med. Woch.* 1914. Apr. 30. Vol. 40. No. 18. pp. 892–895.

The author commences by describing the experiments of Wilcox and Hopkins, who found that the amino-acids were necessary in diet, and that foods such as maize in which they are absent are defective. His previous researches on the lipoids in relation to beriberi and scurvy are referred to, and he defines lipoids as

non-saponifiable substances regularly found in animal and vegetable cells, having the same properties of solubility as fats. His investigations were carried out to determine whether these lipoids, constantly taken with ordinary food, can be built up in the body if not supplied in the food. Out of over 100 animals fed on lipoid-free food not one lived; in spite of the fact that their appetites were not affected, the animals lost weight quickly and in 3–4 weeks died showing progressive loss of weight and weakness. If any lipoid-rich substance as yolk of egg or calves' brain was added, the animals recovered, and he showed by experiment that these protective substances were destroyed by long boiling. If the ordinary food of mice was heated and extracted with alcohol and then given to them the animals all died; that is, this procedure had the same effect as feeding the mice on lipoid-free food. Heating the food in water produced the same result, but it was not so marked. It is possible that this is due to some alteration of grouping of the atoms which the body could not build up again, or possibly the heating may produce some poisonous substance; the latter view the author does not think correct. His experiments with lipoid-free foods proved that the result is not due to a want of, or change in, the inorganic salts—neither was it due to want of fat, for the addition of lipoid-free fats from milk or butter did not protect the animals, but alcoholic extracts of dried skim milk were effective. The addition of cholesterin, lecithin, phytin, etc., to the prepared food was also useless; therefore some other unknown substance was required, viz., vitamines.

He attempted to isolate the protective substance from egg by fractional distillation. Animals receiving an acetone extract all died. If this acetone-extracted yolk of egg was not extracted with alcohol, and this was added to the food the animals lived longer, but if egg was directly extracted with alcohol, the extract was curative. Normal food for mice was extracted with ether in a Soxhlet's apparatus for 9 days; 10 mice were fed on this and all remained well for 45 days; afterwards the same mice were fed on the same food, which had been treated with 96 per cent. alcohol, and all died in 23 days. Therefore, ether does not separate any substance important to life, whereas alcohol does.

In the latter part of the paper the clinical characters of beriberi are given and the various theories of Eijkman, Schaumann, Funk, Nocht and others are described. The author concludes that in varied diets substances are present necessary for life, that these can be extracted by alcohol but not by ether, that pure fat and other lipoid combinations as yet tried, when added to an extracted diet do not render the food efficient because they are not able to supply the essential vitamines. Probably vitamines plus certain lipoids are necessary.

P. W. B.–S.

Cooper (E. A.) **The Curative Action of Autolysed Yeast against Avian Polyneuritis.**—*Biochemical Jl.* 1914. June. Vol. 8. No. 3. pp. 250–252.

Methods are described for obtaining an active preparation from yeast able to cure pigeons and chickens suffering from experimentally produced polyneuritis, and it was shown that large

amounts, even ten times the curative dose, had no injurious effects. Both the solution and air-dried yeast retained their curative properties for long periods. He concludes "that autolysed brewer's yeast should afford a simple inexpensive method of preparing a non-toxic solution suitable for the oral treatment of beriberi."

[It does not by any means follow that because these yeast preparations are able to cure polyneuritis in birds they will do the same for the more chronic disease as seen in man; in fact, yeast treatment has usually given disappointing results when tried in the wards.]

P. W. B.-S.

Ramoino (Paolo). **Contributo allo Studio delle Alimentazioni Incomplete. Nota 1.—Stato Attuale della Questione.**—*Pathologica.* 1914. Nov. 1. Vol. 6. No. 144. pp. 541–550.

In this somewhat lengthy contribution the author reviews a great deal of the literature that has appeared during the last twenty years bearing on food deficiency as a cause of disease; the work of those who have studied beriberi, scurvy and pellagra being freely referred to. The paper contains no new facts, but is interesting reading.

P. W. B.-S.

UNDULANT FEVER.

CANTANI (Arnaldo). **Sintomi e Complicazioni non Comuni della Febbre di Malta.** [Uncommon Symptoms and Complications of Undulant Fever.]—*Riforma Medica.* 1914. May 30. Vol. 30. No. 22. pp. 595–601.

The author describes some of the symptoms and complications which have within the last few years been described as associated with undulant fever and are not dealt with sufficiently, or even mentioned, in the text books on tropical medicine. These are, splenomegaly, enlargement of the liver, jaundice, enlargement of the mesenteric glands, suppuration, phlebitis, arthritis, endocarditis, bronchitis, cutaneous affections, meningitis, chorea and psychoses. [It is not possible or necessary to describe these various phases here, and many of the papers quoted have been reviewed during the past two years in this *Bulletin*.] Very large spleens simulating those found in splenic anaemia and mistaken for that condition were found in 6·6 per cent. of the author's cases, but not until the fever had lasted six months or more; usually the spleen is scarcely palpable. Enlargement of the liver with jaundice and ascites has been noted by several observers and is generally seen late in the disease; a case is fully described. The enlargement of the mesenteric glands, which always contain the specific micro-organism, is a constant feature in animals infected by feeding experiments. That the *M. melitensis* can cause areas of tissue necrosis, endocarditis and arthritis is well known, but cases of phlebitis (in women), meningitis and chorea have only lately been recorded, mostly in young children from southern Italy and Sicily. In the convalescence of a cachectic case unfortunately neuroses of all kinds are only too common.

[This paper is important, as it draws attention to some of the unusual characters to be found in this prolonged disease; all are explained by the septicaemic condition and the irritation produced by the toxins elaborated by the organism, but it requires very careful differentiation to distinguish between a true complication and a distinct condition occurring in a patient whose blood still contains agglutinins of a past infection. The great enlargement of the spleen and liver causing difficulty of diagnosis from kala azar, the reviewer has experienced; the spleen was punctured for diagnosis and the patient died; the spleen weighed 56 oz. and the liver 104 oz. Endocarditis is also not very uncommon and may be due to the *M. melitensis* as well as the ordinary pyogenic cocci. One case of Sir Patrick MANSON'S was diagnosed as infective endocarditis until a blood culture showed the true cause, and the reviewer has had two such out of 750 cases.]

P. W. Bassett-Smith.

CANTANI (Arnaldo). **Azione del Micrococcocco Melitense sul Sistema Nervose Centrale.**—*Malaria e Malat. d. Paesi Caldi.* 1914. May-June. Vol. 5. No. 3. pp. 151–155.

In clinical descriptions of undulant fever many references have been made to symptoms indicating some changes in the central nervous system. GROCCO noted bulbar signs, such as disturbance of cardiac

and respiratory rhythm, with uncontrollable vomiting not associated with loss of consciousness. TOMASELLI mentions paralytic attacks. TIMPANO describes a case having on the fourteenth day of the fever intense occipital headache with photophobia, vomiting, delirium and clonic contractions. HUGHES describes a malignant type accompanied by headache, insomnia, delirium and vomiting.

The author gives in some detail the course of three cases with marked symptoms of central irritation, all of which recovered. The first was thought at the early stages to be a bad case of typhoid, but the serum reaction was negative for this but positive for undulant fever (up to 1 : 1,000) and the *M. melitensis* was cultured from the blood. The cerebral signs were headache, semi-coma, dilated and sluggish pupils and an increase of tendon reflexes; these passed off in 6–7 days, but the fever continued for three months. The second case was that of an infant with well marked undulant fever followed by a choreiform condition; the serum agglutinated the micrococcus up to dilutions of 1–800. There was no history of rheumatism nor cardiac lesion, and no cause could be demonstrated for the nervous symptoms other than the melitensis infection. The third patient, a woman aged 28, suffered from severe fever for three months, with sweats, enlargement of the spleen and other symptoms of undulant fever; this was followed for a further period of three months by slight irregular pyrexia. The agglutination reaction was positive up to 1–1,600 and the *M. melitensis* was isolated from the blood. Mental symptoms were severe and prolonged, there was semi-mania with periods of unconsciousness, etc., followed by a state of marked asthenia. The tendon reflexes were increased but there was no disturbance of sensation. After removal to a sanatorium these psychical symptoms passed off and the patient made a good recovery.

A knowledge that these various nervous symptoms may be produced by the action of the *M. melitensis* or its toxin should make observers careful to differentiate etiologically all such cases occurring in an endemic area by a careful blood examination.

[The author has previously described similar conditions in cases of undulant fever.]

P. W. B.–S.

STEFANO (Chirico). **Osservazione Cliniche sul Decorso della Febbre Mediterranea in S. Eufemia d'Aspromonte.**—*Malaria e Malat. d. Paesi Caldi.* 1914. May-June. Vol. 5. No. 3. pp. 186–188.

From March to October 1913, a small epidemic of undulant fever was present in Aspromonte, Reggio Calabria. This affected chiefly individuals from 30 to 60 years old. At first it was often difficult to diagnose the disease from malaria and typhoid, but generally the course was that of a moderately severe type of undulant fever, with sweats, articular pains, neuritis and remittent or intermittent fever. Four cases are described more in detail; one was particularly interesting, being complicated with mucous haemorrhages from the mouth, epistaxis, purpura, and finally haematuria.

P. W. B.–S.

MARTELLI (P. N.). **Contributo alla Conoscenza della Flebite nella Febbre Mediterranea.**—*Policlinico.* sez. practica. 1914. Sept. 13. Vol. 21. No. 37. pp. 1313–1315.

Reference is made to the observations of CANTANI demonstrating the occurrence of phlebitis as a complication of undulant fever. Having had considerable opportunity of observing cases of the fever, both in and out of hospital, the author describes in detail a case of his own in which this symptom was present. The condition was noticed on the sixth day after admittance to hospital and the eleventh day of the disease; it affected the left lower limb, and lasted fourteen days. In this case and in those of CANTANI marked anaemia was present, which was looked upon as predisposing to the phlebitis. The examination of the blood showed that there was a marked relative decrease in the polynuclear leucocytes, and a definite leucopenia. Treatment with Trambusti-Donzello's serum gave satisfactory results.

P. W. B.-S.

MAILLART. **Fièvre de Malta contractée à Genève.**—*Rev. Med. de la Suisse Romande.* 1913. Dec. 20. Vol. 33. No. 12. pp. 921–924.

A detailed account is given of a case of fever during the summer of 1913 in the person of a woodman aged 36. The pyrexia was of a distinctly undulant type, made up of three waves and attended with profuse sweats, but without any other marked physical signs of disease. Blood culture and agglutination tests did not confirm the clinical diagnosis of undulant fever, but these were not carried out until the patient had almost recovered from the third attack of pyrexia and the author thinks that, as the disease was of so benign a form, it is possible that no antibodies might have been then present and that the *M. melitensis* was unlikely to be in the peripheral blood. The interesting factor in the case was that the man had during some months previous to the onset of the disease been employed slaughtering sheep which had come direct from Algeria, but he had never had anything to do with goats.

[This case is of interest, but is not sufficiently definite without further confirmation to incriminate Geneva as an endemic centre of undulant fever.]

P. W. B.-S.

SERGENT (Edward). **Le Fièvre Ondulante: Diagnostic et Traitement. Epidémiologie et Prophylaxie.**—*Paris Médical.* 1914. Aug. 1. No. 35. pp. 224–226

The author discusses the methods of diagnosis and treatment of undulant fever, with a few remarks on the epidemiology and prophylaxis. The clinical variations of the disease are so great that diagnosis is often very difficult. The serum agglutination test was for a long while believed to be as reliable as the Widal test for typhoid, but lately many irregularities have been noted making the reaction less useful. For this method the following factors have been postulated as necessary:—(1) A microbe not agglutinated with normla

serum or that taken from a patient suffering from a disease other than undulant fever; (2) a microbe which shall always be agglutinated by a serum from any case of the disease due to this microbe. With regard to the first, it is difficult to recognise a normal serum owing to changes which may be produced by slight attacks, or even the ingestion of different foods. It is known that non-specific agglutinins frequently occur but most often in pyrexial conditions as typhoid, typhus and tubercle; these have been shown by NÈGRE and others to disappear on heating the serum for half an hour at 60° C, but this heating also destroys some of the specific agglutinins; with a heated serum, therefore, a positive reaction is conclusive, whereas a negative one is not. With reference to the second postulate, we have to recognise that there are great differences in the strains of the *M. melitensis*, the most important being that known as *M. paramelitensis*; these individual variations should be carefully noted and registered, for their use has often caused considerable error.

He states that one fifteenth of all the cases from Algeria and Central France have been treated with an anti-melitensis antitoxic serum prepared by NÈGRE and himself, with good results, but that in three cases, one from Paris and two from Corsica, in which the serum had not been tested against the strain used to immunise the horses, no good result followed; this shows that a polyvalent serum must be employed. He points out the danger of carrying out serum reactions without using the proper precautions, and quotes a case of fever with a deep abscess which led to an unfortunate result. This uncertainty with the serum test makes it important to use also blood, milk, and urine cultures if possible, but the author still thinks that the former should not be omitted as it is always useful and often sufficient, proper precautions being taken as to age of culture, clearness of emulsion, methods of observation and reliability of the strain (one that does not auto-agglutinate and reacts easily with immune serum) and heated serum being used. He states that the microscopic method should always control the sedimentation and that a time limit is unimportant. If these conditions are carried out, a positive reaction in a dilution of 1 : 50 is definite.

Undoubtedly the principal reservoir is found in the troops of goats in the endemic areas, but man and other animals may act as carriers. There are also many other means of contagion and the *M. melitensis* appears to pass easily through mucous membranes. The methods of prophylaxis are, cook all food and milk, notify all cases and disinfect; inspect animal houses and interdict importation of goats without bacteriological examination.

P. W. B.-S.

BETTENCOURT (Nicolau). (i) **A Diagnose Laboratorial da Melitococcia (Febre de Malta).**—*Medicina Contemporanea.* 1914. May 31. Vol. 32. No. 22. pp. 171–176.

(ii) **Le Contrôle Bactériologique de la Mélitococcie chez l'Homme et chez les Animaux.**—*Arquiv. d. Inst. Bact. Camara Pestana.* 1914. June. Vol. 4. No. 2. pp. 195–209.

i. This is a critical review of the various methods that are employed for the diagnosis of undulant fever, giving extracts from the chief

papers on the subject up to date (1914). As the author has had many years of personal experience in laboratory work, the conclusions which he has come to are of special interest and are here given briefly :—

Procedure for man :—

(1) To isolate the pathogenic organism—(*a*) By blood culture, 5 cc. of blood are obtained during a febrile period, if possible at the height of the wave, mixed with 10 per cent. citrate solution and put into 100 cc. of nutrient broth+2 reaction, incubated at 37° C. for six days and then sub-cultured on to solid media. (*b*) From urine taken either at the end of a wave or during convalescence. The method may be assisted by mixing some strong anti-serum to agglutinate the organism ; then centrifuge and plate.

(2) Demonstration of antibodies—(*a*) 4 or 5 cc. of blood are obtained, the serum is separated from the clot and heated to 56° C. for half an hour, and tests are put up for agglutination in dilutions of 1 : 50, 1 : 100, 1 : 200, and 1 : 400. Two or more strains of the *M. melitensis* should be used and the strain *M. paramelitensis* avoided, 1 cc. of the diluted serum being used with the emulsion made from a young culture, and the result read off in 24 hours. This should be verified by specimens incubated for 2 hours at 37° C. Controls of normal serum are put up at the same time. Negative results require repeating. (*b*) Fixation of complement—useful when agglutination reactions are negative, or to confirm their results. The antigen is made from *M. melitensis* or *M. paramelitensis* in saline solution, 100 million per cmm., heated for one hour at 60° C. For complement fresh guinea-pig serum is used, and the usual haemolytic system, the results being read off in 12–24 hours. If the results are negative, they should always be repeated with a fresh sample of blood.

For animals—(1) Test for specific agglutinins in the serum as in man. For agglutination reactions with milk, six or eight drops of acetic acid may be added to 15 cc. of milk, which is shaken and filtered repeatedly so as to obtain a clear limpid fluid, or the whole fluid can be used, but the results are less reliable than serum reactions. (2) Isolation of the *M. melitensis* from the milk (care being taken to disinfect the teats and the hands of the operator) ; this is sedimented and plated directly on to nutrose or glucose media.

A short bibliography is added.

ii. This is a very well written description of the laboratory diagnostic methods utilised for the differentiation of undulant fever in man and animals. Though it covers thirteen pages there are no novel points to refer to. The author regards blood culture as being the most definite method, spleen culture being too dangerous and urine culture too difficult for practical application. For serum reactions he insists on the use (1) of a living emulsion made from a 24-hour growth on solid media of *M. melitensis* ; (2) a strain that does not agglutinate too easily (not *paramelitensis*), or with other infected sera ; (3) the serum to be heated to 57° for half an hour, but a small portion kept unheated to be tested also if a negative reaction is obtained ; (4) a series of dilutions, 1 : 50, 1 : 100, 1 : 200, 1 : 400, to eliminate paradoxical reactions ; (5) the sedimentation method, using 1 cc. of diluted serum and a time limit of two hours with the tubes in the hot incubator.

The method of complement fixation is described and recommended to be used when the serum reaction is negative or to confirm this,

but in all cases where a negative result has been obtained it is wise to obtain a new sample of blood some days later and carry out all the tests again.

For diagnosis in animals he does not speak favourably of the lacto reaction even when the various modifications are employed, but depends upon serum agglutination and culture from the milk.

A very important consideration is pointed out with regard to agglutination reactions, namely that the minimum limit of dilution for diagnosis depends upon two factors which are very variable: the agglutinating capacity of the micrococcus and the agglutinating power of the serum. The sensitiveness of the particular strain of the micrococcus must be known in fixing the minimum limit, and it must be remembered that heating the serum reduces the chances of error enormously, yet occasionally it may cut out the specific agglutinin. Hence the unheated serum should also be tested.

P. W. B.-S.

Ferro (Paolo). **Sul Valore Clinico della Sieroreazione di Wright.**—*Riforma Med.* 1914. Vol. 30. No. 7. pp. 261–264.

The author commences with a short account of the difficulties attending sero-reactions in *melitensis* infections, and the modifications that have been suggested; he then describes his own technique. He agrees with most recent workers in preferring the macroscopic method, reading off the result after two hours in the hot incubator and using an emulsion made from a reliable culture not more than 36 hours old. Working with seven strains and a large number of different sera he found considerable variations, one strain which was very similar to *M. melitensis*, Br. Nicolle, being very unreliable. Heating the serum reduced the agglutination value considerably and he does not consider this to be either necessary or desirable. The use of a killed emulsion of a well-tested strain heated to 60° C. and preserved by the addition of formalin he thinks is very advantageous, for it keeps well for over a year and with it more definite comparisons can be made.

From his researches he concludes that the practical value of Wright's method is very great, but that the utmost care must be taken to avoid using unsatisfactory cultures, namely those that agglutinate too easily. With a good strain a dilution of 1 : 100 is sufficient for diagnosis; heating the serum is unnecessary and dead cultures can be most usefully employed.

P. W. B.-S.

Tallo (F.). **Ricerche Sperimentali sulla Latenza del Micrococco di Bruce nella Bile.**—*Policlinico.* Sez. Pratica. 1914. June 28. Vol. 21. No. 26. pp. 925–926.

Recent epidemiological research has shown that in microbic diseases it is of the greatest importance to determine by what means "carriers" remain infective and how they disseminate the specific organism. The possibility of the *Micrococcus melitensis* living in the gall bladder has been recognised and the author carried out experiments both in vitro and in vivo to prove whether bile was a good culture medium or

not. In vitro, using a four-day agar culture (Kral's strain) inoculated into sterile bile of various laboratory animals and sub-culturing from day to day, he found that the organism continued to grow well, showing no abnormal morphological changes. Five guinea-pigs were inoculated intravenously with 1 cc. (or a sub-lethal dose) of an emulsion made from a four-day agar culture. The results are shown in the following table :—

Guinea-pig	Weight.	Day of Examination.	Persistance of M. M. Blood.	Bile.
1.	430 grms.	24 hours	+	+
2.	410 ,,	3 days	+	+
3.	425 ,,	6 ,,	+	+
4.	460 ,,	9 ,,	—	+
5.	400 ,,	12 ,,	—	+

The organism disappeared from the blood after the sixth day, but was recoverable from the bile on the twelfth. In vivo the bile appears to be a good culture medium. This fact is of great importance when dealing with carriers of the disease.

[The *M. melitensis* was recovered from the bile of human cases in two out of eight examined in 1905 by Kennedy, and from faeces by Eyre once.]

P. W. B.-S.

Cummins (S. L.), Coppinger (C. J.) & Urquhart (A. L.). **Further Observations on the Presence of Antibodies for** *Micrococcus melitensis* **in the Milk of English Cows.**—*Jl. R. Army Med. Corps.* 1914. July. Vol. 23. No. 1. pp. 36–41.

After referring to the work done by Kennedy and Bassett-Smith on samples of cows' milk obtained in London, in which agglutination of the *Micrococcus melitensis* was obtained, and to the fact, shown by Horrocks in Gibraltar and Shaw in Malta, that cows may contract a true *melitensis* infection, the authors describe some fresh work which they have lately carried out. From one dairy in London the milk of seven cows was examined ; of these two gave positive results, one agglutinating the strain of *M. melitensis* used in dilutions varying from 1 : 250 to 1 : 1,000. The milk and serum of this one cow were further examined in detail with regard to agglutinins, opsonins, and deviating substances. The following points were determined : (1) The milk, whey and blood serum all agglutinated in corresponding dilutions ; (2) The agglutinins were demonstrable in the milk when tested almost immediately after drawing ; (3) The agglutination did not depend upon the presence of acids ; (4) The agglutinins were thermostabile, paradoxical reactions being produced by heating the milk to 57° C. for 25 minutes ; (5) The milk contained no agglutinins for other specific organisms ; (6) The whey after three weeks agglutinated the *M. melitensis* as powerfully as before ; (7) Filtration gave varying results.

The milk, whey and blood serum of this particular cow contained thermostabile opsonins for the *M. melitensis*.

No deviating substances were demonstrated in the inactivated milk, but once the inactivated serum gave a positive result, which, however, was not confirmed. The authors conclude that the milk, whey, and serum of the cow tested behave to the *M. melitensis* as those of an animal suffering from the disease or immunised to the organism.

[The chief importance of this examination depends upon the definite relationship of the agglutinins in the blood serum and the milk, but the almost complete absence of complemental deviations with milk, whey, and serum tends rather to discount the positive agglutination and opsonic results.]

P. W. B.-S.

Izar (Guido). **Sulla Chemoterapia dell' Infezione Melitense. Nota 2.** —*Pathologica.* 1914. Nov. 1. Vol. 6. No. 144. pp. 536–540. With 7 charts.

In 1913 the author made a number of experiments on rats which showed the prophylactic and curative action of ethyl-copper-chloride in experimentally produced melitensis infections (this *Bulletin*, Vol. 3, p. 219). In the present paper he describes a further series in which rabbits were used, these animals being preferable as in them the disease runs a longer and more regular course. The animals had a fairly regular average weight of 1900–2000 grams, an emulsion of a 48-hour culture of M. Br. (Micrococcus of Bruce) was employed in each case, but the amount injected varied in different experiments; the inoculations were usually made intraperitonally. A normal dose was first estimated, and for the experiments ten times this was used, namely one that killed the rabbit in about 28 days. When the animal's serum gave an agglutination reaction of $\frac{1}{200}$ or over, the treatment was started and usually six injections were given at intervals of 1–2 days. The drug was either given in a dose of ·05 gm. in a watery solution intravenously or ·15–·25 gm. as a base, intramuscularly. Tables of the experiments are provided showing the weights of the animals, etc., and charts with the course of the temperature and agglutinative curves in treated and untreated animals. The results obtained showed that the alkaloid had a specific curative action, arresting the infection in 68 per cent. of the cases if the treatment was started before the ninth day, but if commenced after that time no animal was saved. In the animals which were recovering after receiving injections the agglutination curve rose high (1 : 5,000-1 : 8,000) and continued high when the temperature was normal.

[These results are of great interest as they were founded on a very large number of accurately carried out experiments.]

P. W. B.-S.

Book Reviews.

Tibbles (William). [LL.D., M.D. (*Hon. Causâ*) Chicago; L.R.C.P. Edin.; M.R.C.S. Eng.; L.S.A. Lond.]. **Dietetics, or Food in Health and Disease.**—x + 627 pp. 1914. London: Baillière, Tindall & Cox, Henrietta Street, Covent Garden. [Price 12*s.* 6*d.* net].

This is a comprehensive, concise work, written so simply that it is quite readable in spite of the mass of detail with which it deals. It is divided into two parts, the former of which treats of the physiology and physics of food while the latter is devoted to the diet necessary in various diseases. The tables on food values supply a distinct want. It is found that protein starvation is not uncommon amongst the British poor, who have to live upon a diet of tea and bread and butter, with an occasional bloater or other appetizer. Such a diet, though it may produce sufficient heat, does not give the consumer strength and endurance, and the author strongly recommends a free use of peas, beans, lentils, and nuts when the cost of meat, poultry, fish, eggs, or milk is prohibitive.

He finds that mental work cannot be done so well with alcohol as without it, but he allows that small doses of beer, wine, or diluted spirits are permissible for the brain worker whose stomach has lost tone through a sedentary life, overwork, or worry. Like other physiologists, he states that alcohol does not give strength or power of endurance, but that it is a poison to protoplasm and depresses cellular activity.

Soldiers "can bear hunger and fatigue, heat and cold, snow or rain, better without it." On the other hand, the caffein of tea and coffee increases the capacity for both muscular and mental work, and with moderate doses there is no evidence of reaction. Smoking tea in cigarettes is apparently the most injurious way of consuming it, great excitement of the nervous system being caused. Coffee has the advantage of warming the body in winter and cooling it in summer by stimulating the sweat glands. Coca is used extensively in South America to enable the body to endure prolonged exertion without food and to prevent nervous and muscular exhaustion, but excessive use of it diminishes the intellectual powers and deteriorates the moral faculties.

The author asks, but declines to answer, the question, "What is a moderate amount of tobacco?" The reviewer's experience is that any number of cigarettes exceeding 50 per day is dangerous, and that those who smoke between 20 and 50 daily are running a risk which most nervous systems cannot stand. The author mentions tobacco amblyopia, but does not seem to be aware that this is almost unknown among those who only smoke cigarettes, especially if they are teetotallers.

The diet of Europeans in the tropics is wisely considered and on this point Sir Havelock Charles's advice is quoted.

The first chapter of the second part is devoted to diseases of the stomach and consists of 56 pages. We notice that the author recommends rectal feeding for painful ulcer of the stomach for 15 days, though he allows upon another page that the daily value of the food absorbed by the rectum is only an average of 390 calories, or one-sixth of what is required by a person whose metabolism is at a low level. He gives under the various headings of the book the pros and cons, and quotes here Wynter, who said: "Nutrient enemata satisfy the mind rather than the body." We cannot quite endorse the old-fashioned view that "the treatment of duodenal ulcer is the same as that of gastric ulcer."

Under the heading of chronic tropical diarrhoea the ordinary views about the diet of sprue are briefly mentioned and medlars are suggested as a substitute for strawberries.

In the diet of most diseases there is little new, but gout is defined as "retention uricaemia," and stress is laid upon the importance of the patient finding out for himself by the experimental method what articles of food and drink he should eschew.

In typhoid fever "moderate feeding" is commended, such as adding to the ordinary liquids two or three raw eggs, farinaceous foods, and custard

and jelly *ad libitum*. The author says that he has used these additions for more than thirty years and can strongly recommend them. When typhoid patients are badly fed, their tissues are rapidly destroyed and acidosis occurs. Moreover, he holds that carbohydrates prevent the toxaemia, by avoiding the formation of toxins in the cellular tissues. Most medical men are aware, but the general public is not, that reliance to a great extent cannot be placed on beef-tea, soup, broth, and other meat infusions for feeding fever patients. Even when the "grounds" are included a pint of beef-tea contains only the nutriment of one ounce of beef. Moreover, the salts are out of proportion to the nutriment and the result is increased thirst and the addition of waste nitrogenous matters to be excreted. Eggs come next in importance to milk; two eggs contain 13·5 grammes of protein, 11·6 grammes of fat and 163 calories, that is, more nutriment than a pint of beef-tea at a quarter of the cost.

To those who are chiefly interested in tropical diseases it is possible that the final chapter of the book on Vitamines and Deficiency Diseases may prove the most attractive. The author may be congratulated upon having achieved the aim mentioned in the Preface which was "to give an account of the most recent researches in these subjects and to place the results in a proper light." Vitamines are present in fresh unboiled milk, eggs, meat, yeast, meat extract, in all grains which have not been deprived of the pericarp, in some beans and in all rapidly-growing vegetables. Half of the mortality in Manila is said to consist of infants under one year of age and half these infants show some sign of beriberi because they are breast-fed by unhealthy mothers. But the author does not lay stress on the interesting fact that ailing babies become healthy when rice-polishings are administered to the nursing mother.

Zein or maize protein is deficient in tryptophane; it does not cause growth and is insufficient to maintain the life of mice. It is suggested by the author that the presence of pellagra in the United States to-day in contrast with its absence during the Civil War is due to the effects of modern milling, by which the maize loses 75 per cent. of the fat, the germ and the important substances of the pericarp. Sailors, fed for a long time on dried or pickled meat, dried potatoes, rice, bread and biscuit, often develop scurvy and beriberi, yet they recover when fed on "fresh meat, fresh vegetables, yeast, Katjang idjo beans and testicular extract which contain vitamines."

It is stated that yeast contains several vitamines, and to certain fresh vegetables, such as potatoes, cabbage, carrots, onions, must be added "dandelion leaves", which are said to be particularly rich in vitamines. Scurvy, it is maintained, is due to a monotonous diet, but chiefly "to the absence of *freshness* in the food."

A short resumé is given of the connection between polished rice and beriberi and the experimental polyneuritis of fowls. The so-called beriberi of Brazil is also mentioned, and the 15·6 per cent. of cases among railway navvies who died. They ate no rice, but lived on a varied diet of dry biscuit, dried meat, cured fish, tinned meat, tinned fish, beans and macaroni. The number of cases lessened when fresh meat, potatoes and onions were included in the diet.

The chief theories with regard to the etiology of pellagra are mentioned, and the author is of opinion that the theory of association of this disease "with the consumption of maize has not given place to any theory supported by an equal weight of evidence."

This useful book ends with three pages on the rôle of the lipoids and the inorganic salts in metabolism. It is concluded that the lipoids essential to the organism are probably not vitamines, nor are they amino-acids, but they are essential to enable the vitamines to enter the living cells of the organism.

F. M. Sandwith.

HINDLE (Edward), [B.A., Ph.D.]. **Flies in Relation to Disease. Blood-sucking Flies.** — xv + 398 pp. With 88 text-figs. 1914. Cambridge: At the University Press. [Price 12*s*. 6*d*. net].

It is not too much to say that this is the best-digested treatise on

blood-sucking flies, in their actually established relation to disease, that as yet appeared.

The outworks of the book consist of a short general introduction in which some historical and ontological aspects of the subject are tersely and lucidly considered, and of a more particularised introductory discourse on the structure, biology, and classification of the Diptera. These two chapters lead up to a formal list of blood-sucking flies that are known to transmit infection, arranged by families in systematic order. Thereafter, each family included in the list is reviewed separately; first in respect of its structural features, biological character and relations, and taxonomic composition; and then in specific detail, with regard to its pathogenic significance and sanitary import. This last aspect of the subject includes —in every ascertained case—a precise account, descriptive and historical, both of the processes of infection and of the morbific agent transmitted.

For instance, in dealing with the family *Culicidae* a survey of the external characters, internal structure, post-embryonic development, natural history and classification, and a review of the pertinent groups and species, is followed by critical accounts of the several infections transmitted by Anophelines and Culicines, and of the parasites of malaria, filaria, etc., in all their relations to their hosts, and by a succinct and judicious discussion of preventive measures, especially those which entomological research suggests.

The excellence of the book is manifested in many ways, not by any means least in its clear and even style, its proportion and balance, and its transparent fairness in matters that at times have been somewhat obscured by controversy, this last quality being seen to advantage in the pages dealing with the history of malaria.

It is perhaps a little unfortunate that the precision of the main title of the book—Flies in Relation to Disease—excludes the *Simuliidae* and the blood-sucking Chironomids from consideration, but the author of course is justified in restricting himself to the limits of admitted fact. It is also rather a pity that the author has incommoded himself with the terrible burden of names that has accumulated about the genus *Anopheles*; a critical redaction of the species according to geographical regions would have been at once more instructive and more effective.

The author is to be felicitated on his frank statement that the prevention of protozoan infections in the tropics is very largely an entomological problem; those, however, who know what a tropical village and its inhabitants are like may yet feel some doubt that the destruction of *Stegomyia fasciata* is a "comparatively simple" matter.

A. Alcock.

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FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE. Comptes Rendus des Travaux du Troisième Congrès Biennal tenu à Saigon (Cochinchine Française), 1913. Publiés par M. L. R. MONTEL, Secrétaire Géneral du 3e Congrés, Médecin des Services Municipaux de la Ville de Saigon.—pp. xxiii + 557 + iii. With 15 plates. Roy. 8vo. 1914. Saigon: Imprimerie Nouvelle, A. Portail. [Price 15 francs.]

FLU (P. C.) Malaria en Malariabestrijding.—23 pp. 1914. Batavia: Javasche Boekhandel & Drukkerij.

FLU (P. C.) Maatregelen ter Voorkoming van Pest.—11 pp. With 3 text-figs. and 3 diagrams. 1914. Batavia: Javasche Boekhandel & Drukkerij.

GHOSH (Birenda Nath) [L. M. S.] & DAS (Jahar Lal) [L. M. S.]. A Treatise on Hygiene and Public Health with Special Reference to the Tropics. With an Introduction by Colonel Kenneth MACLEOD [M.D., L.L.D., F.R.C.S.]—2nd Edition. xvi+394 pp. With 48 text-figs. Crown 8vo. 1914. Calcutta: Hilton & Co. [Price 6s. net.]

LAVORI DELLA SOCIETÀ ITALIANA DI PATOLOGIA ESOTICA. Quarta Riunione tenuta a Messina il 27–28 Giugno, 1914. Publicazione per Mandato del Consiglio direttivo ad opera de Professor Dott. Umberto GABBI.—194 pp. With 3 coloured plates and 1 text-fig. 1914. Roma: Tipografia Moderna, Via Portico d'Ottavia, 57.

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